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ABSTRACT

It is generally accepted in the library world that an automated catalog means more accessible data for patrons, greater productivity for librarians, and an improvement in the sharing of bibliographic data among libraries. While the desirability of automation is not a controversial issue, some aspects of automating remain problematic. This article surveys the automation options available to libraries with Hebrew and Arabic script collections. It also examines the automation decisions that different libraries worldwide have made about automating such collections, particularly considering how their choices relate to overall prioritization and needs assessment at the institution. A library may choose to Romanize the cataloging data, to use nonRoman script cataloging, or to implement combinations of both. Standards and case studies are provided for each. Appendices contain sample machine-readable catalog records. (Contains 140 references.) (Author/BEW)

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Decision-Making for Automation:
Hebrew and Arabic Script Materials in the Automated Library

By

Elizabeth Vernon

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Elizabeth Vernon

Contents

Abstract 1

Hebrew and Arabic Scripts 1

Automation Options 2

Romanized Cataloging 2
- Assessment of Romanization 2
- Implementation of Romanization 8
- ALA/LC and ISO Romanization 8
- ANSI Reversible Romanization for Hebrew 14
- Academy of the Hebrew Language Romanization 17

Nonroman Script Cataloging 18
- Assessment of Nonroman Script Cataloging 18
- Nonroman Script Implementations 21
- CDS/ISIS and MINISIS 22
- DOBIS-LIBIS 26

ALEPH 29
- VTLS 32
- Ameritech Horizon 34
- Other Nonroman Script Implementations 34

Combination (Romanized/Nonroman Script) Cataloging 38
- Assessment of Combination Cataloging 38
- Implementation of Combination Romanized/Nonroman Script Cataloging 44
- ALEPH 55
- VTLS 58
- DRA 58
- MINISIS and CDS/ISIS 59

Authority Control of Hebrew and Arabic Materials 60
Name Authority Control in the Romanized Cataloging Environment 61
Name Authority Control in the Nonroman Script Cataloging Environment 61
Name Authority Control in the Combination Romanized/Nonroman Script Cataloging Environment 62
Subject Authority Control 67
The Unicode Standard and the Future of Multiscript Library Automation 68
Conclusion 70
Acknowledgments 75
Appendixes 78
References 84
Acronyms 90
Vita 91

Decision-Making for Automation: Hebrew and Arabic Script Materials in the Automated Library

ABSTRACT

It is generally accepted in the library world that an automated catalog means more accessible data for patrons, greater productivity for librarians, and (via the services of bibliographic utilities) an improvement in the sharing of bibliographic data among libraries. While the desirability of automation is not a controversial issue, how to implement automation remains a problem: what hardware and software to use, what standards to follow, and so forth. Each institution must assess its priorities, determine the needs of its user population(s), and decide which are the most important needs to meet. The institution must also determine if sharing cataloging data with other institutions is a priority and, if so, with which ones? The institution must simultaneously assess its available resources: how much of an investment can it afford to put into hardware, software, ongoing maintenance and licensing costs, and staff time (both for system setup and maintenance and for actual cataloging and processing of library materials)? The final decision will reflect the interplay between the desired results and costs. This article surveys the automation options available to libraries with Hebrew and Arabic script collections and examines the automation decisions that different libraries worldwide have made, with consideration of how these choices relate to the priorities of these institutions. The focus will be on academic and research libraries, with reference to other libraries when appropriate.

HEBREW AND ARABIC SCRIPTS

Hebrew and Arabic scripts bear important similarities. They are both written from right to left. Their short vowels are not represented by separate letters—i.e., these vowels are either omitted altogether or are represented by diacritics above or below the consonantal characters. Some long vowels, particularly in the case of the Hebrew language, may also be represented by diacritics. In addition, the Arabic script is

contextual (letters change form depending on their position within a word; a letter may have up to four forms—initial, medial, final, and independent—not to mention ligatures), and all letters may connect on at least one side with another letter. Hebrew letters, on the other hand, stand individually, except for the special aleph-lamed character used in Judeo-Arabic, and only five Hebrew letters change form—i.e., having regular and final forms. These characteristics have significant bearing on the automation options available to libraries for materials in the Hebrew and Arabic scripts.

The main Hebrew script languages are: Hebrew and Yiddish, along with Ladino, Judeo-Arabic, Judeo-Persian, and Aramaic. The main Arabic script languages are: Arabic, Persian, Urdu, Pushtu, Sindhi, and other Arabic script Indian languages, along with Ottoman Turkish and several Central Asian Turkic languages, Kurdish, pre-romanized Swahili, Hausa, Malayo-Indonesian, and other Arabic script African and South-Asian languages. In this paper, the terms *Hebrew* and *Arabic* will refer respectively to Hebrew- and Arabic-script languages in general; *Hebrew language* and *Arabic language* will be the terms used to refer specifically to those languages.

AUTOMATION OPTIONS

While a variety of hardware and software configurations can be used to automate Hebrew and Arabic script materials, the cataloging options available to the library can be grouped into three categories: (1) romanization (romanized cataloging), (2) nonroman script (nonroman script cataloging), and (3) a combination of romanization with nonroman script (combination cataloging). (In the context of the literature about library automation of nonroman script languages, provision of data in nonroman scripts is often referred to as "vernacular" cataloging.) Both technical and policy considerations may affect the choice of one or another of these options.

ROMANIZED CATALOGING

Romanization refers to the rendering of text in nonroman scripts into roman (Latin) characters. Although romanization is sometimes referred to as transliteration, this term is not completely accurate for the Hebrew and Arabic script languages because the rendering usually involves the supplying of vowels rather than the simple letter-by-letter substitution that the term *transliteration* implies.

Assessment of Romanization

Regarding the technical aspects of automation, romanization is clearly the simplest automation solution for the Hebrew and Arabic script lan-

guages. The only special requirement of the local system is that it support the necessary character set—specifically the diacritics—at the very least for screen display and preferably for printing as well. In the case of ALA/LC romanization, it is necessary that the automation environment support the ALA extended character set (developed by the Library of Congress in the course of the development of the USMARC format and approved by the American Library Association [ALA]), or any other character set with the necessary diacritics. The ALA extended character set is composed of ASCII (ANSI X3.4) and ANSEL (ANSI Z39.47—a set of diacritics and special characters) (Barry, 1991). Similarly, ISO-based romanization requires support of the ISO extended Latin character set (ISO 5426) in addition to the basic Latin character set (ISO 646). This requirement may limit terminal choices if the library is using terminals instead of microcomputers as input/output devices, as well as printer choices, although this is becoming less of an issue with fixed character-set printers gradually disappearing from the scene. Romanization should not, however, represent an obstacle regarding the choice of library automation software itself, particularly if the software package is one geared toward the academic/research library market. As Wien (1994) points out, even diacritic support is not an absolute requirement for the input of romanized data since diacritics may be represented by escape codes, although this is less convenient for the cataloger.

In the early days of library automation, romanization was the only possible automation option for the cataloging of Hebrew and Arabic script materials. Initially, computers could only support the roman script, and even when Hebrew and Arabic characters began to be available in software applications, it took some time for library applications to be written to accommodate them. Charles Berlin, head of the Judaica Division of the Harvard College Library—the first major Hebraica research library collection in the world to be fully automated—points out that, in undertaking the automation of Harvard's Hebraica collection in 1982, "the decision was not romanization per se [rather] the goal was automation and romanization was the only means then available to achieve that goal" (C. Berlin, personal communication, 1995).

Until nonroman script capability was developed in library automation software, the only alternative to automation with romanization was to postpone automation—i.e., to retain the card catalog. For large research libraries in the West undergoing automation, retention of the card catalogs for Hebrew and Arabic collections meant isolating those materials from the larger library collections and therefore from users. This can be demonstrated by the experience of the Ohio State University Libraries (OSUL). During the initial stages of OSUL automation in the early

1980s, librarian and faculty objections to romanization persuaded the library administration to retain card catalogs for its Arabic, Chinese, and Hebrew materials. Librarians soon found this to be an untenable situation, leading to the decision in 1984 to do romanized cataloging for Hebrew and Yiddish via OCLC, at least until an alternative presented itself.

> There were several reasons for our dissatisfaction. First, library patrons started using LCS [the online catalog] with increasing frequency....Whereas in the card catalog they found both Hebrew and non-Hebrew books in a subject search, Hebrew books did not show on a subject search of the online catalog. We started to have the feeling that in the name of preserving the original script in the bibliographic record, we were really short-changing our patrons. (Zipin, 1984, p. 55)

Similar reasons were cited by Straley (1987) for undertaking automation for Arabic materials at OSUL even though this meant romanizing the bibliographic data:

> The decision to discontinue manual cataloging of Arabic script materials was based on a variety of factors. Patrons had to search two catalogs to find OSUL holdings and then search each record on LCS to determine the circulation status and location of the item. With a full catalog record on LCS, the patron would be able to search under all headings and to determine the location and availability of an item, all at a single terminal. In addition, it was felt that processing could be streamlined and cataloging quality more closely monitored if these materials were treated in the same manner as materials in roman script. (pp. 9-10)
>
> Despite the birthing and growing pains experienced at OSUL regarding romanization of Arabic script catalog records, the end results have been very successful. Acquisitions and processing have been made easier because of the full bibliographic records on LCS, as has most problem solving, and we can now begin to use LCS to generate lists and statistics which were not available for this type of material before we began romanizing. Above all, patrons now have the same access to script materials as they have always had to items in English, French, or other roman-script materials; when a subject search is entered on LCS, the patron receives a complete listing of all records containing that subject heading, irregardless [sic] of language or script. (pp. 12-13)

Another advantage of romanization in research libraries in the West is that it allows access to bibliographic data by people who do not read the languages in question. Romanization thus helps integrate materials in these languages into certain library-wide processing and handling procedures such as binding, circulation, retrieval for interlibrary loan, etc. (of course, some functions related to nonroman script materials—cataloging in particular—must be done by staff with language knowledge,

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regardless of whether bibliographic data are romanized or input in the nonroman script). If bibliographic data for material in nonroman script languages were available only in the original script, this would mean that virtually all library functions relating to that data could only be performed by staff with specialized language knowledge. This is an inefficient use of staff resources, particularly in a research library setting with material in many nonroman script languages. The value of romanized data for staff use was cited in the British National Council on Orientalist Library Resources' (NCOLR) (1995) *Report on a Survey on Computerized Activities.* Despite the strong support among librarians surveyed for the implementation of nonroman scripts in bibliographic records, it was noted that: "[Romanized data are] also seen as a means of helping staff who cannot read non-Roman scripts to work with the material. This is a significant factor since several libraries reported the loss of specialist 'language' or 'regional' posts" (p. 3).

In the view of John Eilts, library services officer at the Research Libraries Group (RLG), however:

> The romanization for handling materials is minimal, and not always necessary for such things as serials check-in, circulation, etc. And in fact not always necessary at all as I found out at [the University of] Michigan. The serials people had devised a visual aid that allowed them to check in the appropriate title without knowing the language or script. (J. Eilts, personal communication, 1995)

The disadvantages of romanization appear on two levels. First, for library user populations composed mainly of native speakers of Arabic or Hebrew script languages (primarily in the Middle East), accessing bibliographic data in romanized form is clearly not acceptable for both practical and ideological reasons. Users and library staff should not be expected to learn a romanization system in order to work with bibliographic data in their own language. Indeed, the romanization solution for the automation of Arabic or Hebrew data has never found any serious implementation in the Middle East; institutions in these countries have put their energies into finding hardware/software configurations which allow the provision of bibliographic data in the original script.

Second, for libraries with user populations composed largely of people who are not native speakers of these languages—i.e., primarily those in research libraries in the West—the concerns are largely on the practical level. While there are those who feel that accessing Hebrew or Arabic bibliographic data in the original script is important experientially for researchers and students, the concern most often raised is the fact that

romanization requires specialized knowledge on the part of users and catalogers. Since the vowel diacritics in these languages are rarely given in printed works, romanization is not a mechanical procedure but is rather one requiring the addition of information by the cataloger who must therefore know the language very well. The patron searching for a nonroman script item in an online catalog must also have not only a knowledge of the language of the item that they are looking for, but also additional knowledge of the romanization scheme being used. The relevant romanization scheme or schemes must be learned by the student or researcher to effectively retrieve materials, and as part of its reference functions, the library must be prepared to provide guidance and instruction to patrons about the romanization scheme used. A study by Aissing (1995) on the ability of Russian-language students to use the ALA/LC romanization table for the Russian language, found that students' ability to accurately romanize Russian data was significantly improved after instruction. When searching in the database, the patron may be able to use truncation to search for words when they have doubt about its vocalization, although this may also be a skill that it is necessary to teach the patron.

Familiarity with the romanization scheme becomes less of an issue, however, as use of romanization in automated catalogs spreads. The user population for Arabic and Hebrew script materials in Western research libraries is a specialized one. Romanization is not a new concept to this user community—scholars have long used, and continue to use, romanization for the citation of Hebrew and Arabic works in books and articles. As more libraries automate data using the ALA/LC- or ISO-based romanization rules, knowledge of those rules has become more widespread within this user community. In fact, it can be argued that romanized bibliographic data have helped contribute to greater uniformity of Hebrew and Arabic romanized bibliographic citations in books and articles, where a wide variety of romanization schemes—some formal, some home grown—have abounded. It should be pointed out, however, that there is far greater uniformity within research libraries in the English-speaking world (the adoption of the ALA/LC romanization rules is nearly unanimous) than in mainland Europe, as will be discussed later in this text.

The need for nonroman script access has often been voiced in the Judaica and Middle Eastern librarianship literature, and there have been a few well-known articles dealing critically with romanization in general such as those by Weinberg (1974), Spalding (1977), and Wellisch (1978). There do not appear to be any published user studies, however, regard-

ing effectiveness in precision and recall of patron searches on automated romanized Hebrew or Arabic data in library bibliographic databases. Nevertheless, students and researchers in academic libraries have been using automated romanized Hebrew and Arabic data to access library collections for over a decade.

In public libraries with Hebrew or Arabic collections, the use of romanization is a less appropriate option, since public library user populations cannot be expected to have the same specialized knowledge of romanization rules as do those of research libraries, as pointed out by Apedaile (1994) in his discussion of romanization in Australian public libraries:

> The requirements of a public library are somewhat different from those of academia. Although not mutually exclusive, the clientele of these two types of library tend to be different in nature. In academia a borrower would generally be a student of the relevant language as a second language, or a researcher familiar with the academic romanization conventions or, at least, be in the process of acquiring such familiarity. Public library users are more likely to be non-academic readers looking for recreational or information material in their native language: of course, they may also understand romanization, but it is just as likely that the transliteration system they understand will be other than the ABN [Australian Bibliographic Network] standard and confusion will reign. (p. 106)

As the Arabic and, to a large extent, the Hebrew languages are phonetically regular, romanization of these languages is not likely to present a significant problem for the knowledgeable cataloger or user. The main exception is for personal and place names which may not be of Hebrew or Arabic origin. For this reason, good authority work needs to be done for Hebrew and Arabic names. Where the vowelizing of a name is in doubt, authority records, with all of the possible variant vowelizings, need to be provided, as will be discussed later. For Hebrew and Yiddish, the patron also needs to be aware ofwhich pronunciation the ALA/LC tables are based. "For Hebrew [the ALA/LC romanization table] approximates the modern Israeli, primarily Sephardic, pronunciation. For Yiddish, the table follows the standardized, principally Lithuanian, pronunciation" (Library of Congress, 1991, p. 52). This is less of an issue for Arabic because of the classical form of the Arabic language (*fuṣḥā*) that exists, providing a standard form of reference. There has been objection to the ALA/LC romanization table for Persian (Farideh, 1991; Jajko, 1993) in that it requires Persian vowels to be romanized as if they were Arabic, causing difficulties for patrons. The concern has also been raised that, for some of the more uncommon Hebrew and Arabic script

languages, there may be a problem of finding catalogers with enough knowledge of the languages to do accurate romanization. This is not a large issue since Hebrew, Yiddish, Arabic, Persian, and Urdu account for the overwhelming majority of cataloging being done for Hebrew or Arabic script languages. Moreover, if the cataloger does not know the language, cataloging in the original script—whether automated or on cards—will not guarantee an accurate bibliographic record, nor will it guarantee that a user with a poor grasp of the language will be able to find the desired item.

Implementation of Romanization

While many romanization schemes have been used over the years for the representation of the various Hebrew and Arabic script languages in scholarly texts, bibliographies, and so on, there are only four of major relevance for the romanization of automated bibliographic data in Hebrew- and Arabic-script languages: (1) romanization tables of the American Library Association/Library of Congress (ALA/LC); (2) romanization tables of the International Organization for Standardization (ISO) and ISO-based romanization tables including many of the European national standards for romanization; (3) the ANSI reversible romanization table for Hebrew; and (4) the Academy of the Hebrew Language romanization table for Hebrew.

ALA/LC and ISO Romanization

The first two romanization systems mentioned—ALA/LC and ISO—are characterized by: (1) cataloger-supplied vowels, and (2) the use of diacritic-letter and/or two-letter combinations (digraphs) to represent phonemes which do not have a letter to represent them in the roman alphabet. The primary difference between the ALA/LC romanization tables and ISO-based romanization tables is that ISO-based standards represent every phoneme in Hebrew or Arabic with a single roman letter or diacritic-letter combination, while the ALA/LC tables also employ digraphs in addition to single roman letters and diacritic-letter combinations to represent phonemes. Ottoman Turkish represents the exception in romanization practice in the ALA/LC romanization tables for Arabic script languages; the rules mandate conversion to modern Turkish rather than simple romanization (see Library of Congress, 1991 and Maccaferri, 1985 for the rules governing romanization of Ottoman Turkish).

New or updated ALA/LC romanization tables are disseminated via LC's *Cataloging Service Bulletin*; a collection of existing ALA/LC romanization tables was published in 1991 (Library of Congress, 1991). Maher's (1987)

Hebraica Cataloging, published by the Library of Congress Cataloging Distribution Service, provides more detailed information on using the Hebrew and Yiddish tables. ISO romanization standards are available for purchase through the national standards organizations in each country. In the United States, these are available through the American National Standards Institute (ANSI).

Theoretically, the romanization method used by the ISO standards is a more efficient one, because only one roman letter (or letter with diacritic) is used to represent a phoneme. For this reason, data romanized according to the ISO standard are presently automatically convertible to ALA/LC romanization. The reverse is not currently readily feasible without human pre- and/or post-processing, although it should be possible to create an algorithm to do so. Hebrew and Arabic data romanized according to ISO standards are also theoretically more easily convertible back to the original script. It is important to remember, however, that even if an algorithm is created to convert Hebrew or Arabic romanized data to the original script, this would not mean that retrospective romanized data (whether in ALA/LC or ISO romanization) could simply be converted automatically. Any data conversion needs to deal with the problem of errors in the base data set, but in the case of romanization, special care would be required for review of the data to be converted, because incorrect or absent diacritics would result in the wrong Hebrew or Arabic characters being displayed, rendering the resulting data irretrievable. These errors in diacritics might otherwise never be noticed because they would not interfere with the online indexing and retrieval of the romanized data; diacritics are generally ignored in indexing and retrieval done by input of a search string consisting of the roman base characters only without the diacritics. According to Jill Butterworth, librarian in the Division of Oriental and Other Languages at the Cambridge University Library, the Cambridge University Library has been experimenting with producing Hebrew/Arabic script output from Hebrew/Arabic ALA/LC romanized records although they have not yet been able to fully automate the process, which presently requires editing of output (J. Butterworth, personal communication, 1995).

A survey of library romanization practices by Wellisch in 1976 (before the library automation of major library collections of Hebrew and Arabic materials and indeed before most libraries underwent automation of their catalogues) found that:

> Only in the United States and Canada is there a large measure of uniformity thanks to the almost complete adoption of LC

> romanization, and a similar but not quite as homogeneous situation prevails in Germany; in both instances, uniformity is more easily achieved when a practically monolingual population is served....The widely divergent practices of European libraries (other than the German ones) have their root as much in the phenomenon of having to serve readers speaking different languages as in the traditions on which their practice is based, and the sometimes staggering costs which would be involved in switching from one scheme to another for the sake of greater uniformity....
>
> Not only do different libraries, even in the same country, use different romanization schemes, but older university libraries in particular tend to use several romanization schemes from various sources simultaneously, often depending on which scheme had been published when romanization was first practiced; thus, it is not unusual to find five or six different schemes being used for as many scripts, some of the schemes being the library's own invention, some others being adaptations of published schemes, with ensuing proliferation of local idiosyncracies in the rendering of names and titles. (p. 82-83)

There appears to be no recent comprehensive study available about romanization practices in libraries around the world. Examination does suggest, however, that the conversion from manual to automated cataloging gave libraries an opportunity to examine their cataloging practices and increase standardization, which appears to have improved the situation somewhat since Wellisch's study. Nevertheless, there still exists much variation in romanization practices internationally, particularly outside of the English-speaking world.

The ALA/LC romanization tables are the overwhelmingly dominant standard for romanization of Hebrew and Arabic in the English-speaking world and are used by university and research libraries in the United States, Canada, the United Kingdom, and Australia, including the national libraries of those countries.

The Library of Congress implemented the romanization tables that it had previously developed when it began automated cataloging of its Arabic and Hebrew materials. Joan Biella, senior descriptive cataloger of the Hebraica Team of the Regional and Cooperative Cataloging Division at the Library of Congress, reports that:

> The Library of Congress began on-line MARC cataloging of monographs in Japanese, Arabic, Chinese, Korean, Persian, Hebrew, and Yiddish (the "JACKPHY" languages) in January 1981, with the introduction of the so-called "brief JACKPHY" records. These reproduced in romanization some of the information in the vernacular cards representing the same items. Beginning in May

> 1983, full on-line records were created for these items, providing complete roman-only versions of the vernacular cards. Since November 1987, LC has created records for items in Hebrew and Yiddish which contain full data in both vernacular and roman scripts in the RLIN database, while continuing to provide vernacular cards for the same items. The same dual provision of data began for Arabic and Persian in September 1991. Owing to economic pressures, funding for the production of vernacular cards will cease at the end of September 1995. RLIN records containing full vernacular and roman data will continue to be created and distributed in USMARC format by LC's Cataloging Distribution Service. (J. Biella, personal communication, 1995)

Filstrup (1981) and Weinberg (1989) attribute LC's continued production of cards with Arabic and Hebrew script data after the transition to USMARC cataloging for these languages to the urging of the Middle Eastern and Judaica librarianship communities.

In Britain in 1983, the United Kingdom's branch of the Middle East Libraries Committee (MELCOM UK) agreed on the adoption of the ALA/LC romanization tables for Arabic-language materials for use by all British libraries in anticipation of the creation of a national bibliographic network, although the official national British standard for romanization of Arabic (BS 4280) is based on the ISO standard (Van de Vate, 1986).

A report prepared by Susan MacDougall (1991) for the Australian Bibliographic Network (ABN) points out that:

> From the ABN's point of view, the most relevant developments in multiscript automation are those of Australia's major sources of copy cataloging in the United States...OCLC and RLIN, the two American bibliographic utilities, which are the world's largest bibliographic utilities, accept records using Library of Congress romanization only. In other words, the availability of cataloging copy for Hebrew and Arabic in MARC format (for which the largest sources are the major American research libraries) is a major consideration for the choice in romanization standard for libraries.

The ALA/LC romanization tables do show a bias toward the English language in their use of English diphthongs to represent certain Arabic letters ("sh" for the Hebrew *shin* and "th" for the Arabic *tha* for example), making them less attractive outside of the English-speaking world, even given the availability of a large pool of romanized bibliographic data for copy cataloging. The ALA/LC romanization tables do not appear to be widely used outside of the English-speaking world; the national standards for romanization of Hebrew and Arabic in many European countries are ISO-based.

The ISO standards for the romanization of Arabic are ISO 233 and ISO 233-2 (simplified romanization) and for Hebrew the standards are ISO 259-2 and ISO 259-2 (simplified romanization). The simplified ISO romanization standards which appeared relatively recently—ISO 233-2 (1993) and ISO 259-2 (1994)—are more relevant as models for romanization systems for romanized cataloging; 233-2 for example uses superscript letters to represent certain Arabic characters which is impractical in the context of an automated romanization standard (see Rodinson 1964, for a description of the development of ISO 233).

In mainland Europe, the romanization practices of libraries in various countries show the use of ISO tables, national ISO-based tables, and privately defined (i.e., by individual libraries) ISO-based tables. The variations from table to table are often very slight. For example, the romanization table of the Escuela de Estudios Arabes de Granada differs from the ISO table for Arabic in the use of the letters "j" and "y" instead of the letters "h" and "g" to represent the letters *kha* and *jim* respectively (Jaudenes Casaubon & Torres Santo Domingo, 1994); other national and privately defined ISO-based tables similarly vary in the representation of a letter or letters. As slight as the variations may be, this nevertheless means that the scholar searching the automated catalogs of different libraries throughout Europe must be aware of the exact romanization standard used in each catalog. This is indeed problematic. As Wellisch (1980) points out, the success of romanization as a cataloging strategy for nonroman script materials depends on the ability of searchers to successfully predict how the item will be represented in roman characters. The following provides a partial survey of romanization practices of libraries in Europe for Hebrew and Arabic.

France. In France, the national standards for romanization are maintained by the Association Française de Normalisation (AFNOR); the romanization standards for Arabic and Hebrew are, respectively, Z46-002 and Z46-003 and differ only slightly from the ISO standards on which they are based. Nevertheless, the AFNOR standards for the romanization of Arabic and Hebrew are not in use in all French libraries. For example, according to Odile Walrave (1995), head of the Printed Media Department at the Bibliothèque publique d'information (BPI) of the Centre Georges Pompidou, the BPI uses the AFNOR standard for the romanization of Arabic materials; for Hebrew materials, however, it uses its own non-ISO-based standard. At the Bibliothèque Nationale de France (BNF), the Hebrew and Arabic collections are not yet automated. However, bibliographic data for Hebrew and Arabic publications received as part of the national legal deposit program are input in the BNF's bibliographic database BN-OPALE

in romanized form. In addition, for books translated from Hebrew and Arabic into Western languages, the title of the original version is given in romanized form in the uniform title. Nonroman character titles done during the retrospective conversion of the *Catalogue Général des Imprimés* were left blank with the anticipation that the title would be supplied in the original script when nonroman script capability becomes available. Under the current automation plans, however, the new BNF catalog, EVER, which represents the unification of the BN-OPALE database with the BNF's acquisitions database, will contain catalog records for Hebrew and Arabic (and other nonroman script language) acquisitions in romanization, replacing manual cataloging on cards. Until recently, romanization of the Hebrew language was done according to the ISO-based romanization tables of the Agence Bibliographique Nationale (ABN); after the simplified form of the ISO romanization form for the Hebrew language became available–(ISO 259-2) (1994, revised in 1995), the ISO standard was implemented (BNF-Hebrew, 1995). As for the Arabic language, until the end of 1995, the AFNOR standard Z46-002 (1963) was used, which reproduces the essence of the recommendations of ISO R233 (1961). (Beginning in January 1996, the ISO 233-2 [1993]) standard is being used for the Arabic language [BNF-Arabic, 1996]).

Spain. The Biblioteca Nacional (BN) of Spain uses ISO-based romanization tables for cataloging of Hebrew and Arabic in their online catalog ARIADNA. The Arabic table is that of the Escuela de Estudios Arabes de Granada (for a proposal to provide combination romanized/nonroman script access for Arabic materials at the BN, *see* Jaudenes Casaubon & Torres Santo Domingo, 1994).

Germany. According to Paul Gerhard Dannhauer, head, Near Eastern Section, Oriental Department of the Bayersische Staatsbibliothek, research libraries in Germany use the ISO-based standards of the Deutches Institut für Normung (DIN) for automated romanized cataloging of Hebrew (DIN 31636) and Arabic (DIN 31635) publications, which are included in Appendix 5 of the German cataloging rules *Regeln für die Alphabetische Katalogisierung*—referred to as RAK (P. G. Dannhauer, personal communication, 1995). These tables supplant the Preussische Instruktionen (PI) romanization tables previously widely used in Germany (PI 1909). While the DIN tables are consistent in following the ISO practice of one phoneme/one letter or diacritic/letter combination for Hebrew, Arabic, Ottoman Turkish, Persian, Kurdish, Pushtu, and Urdu, the German DIN Normen for Yiddish do vary from ISO practice in its romanization of the letter *tsadi* using the two-letter pair tz,

although the *tsadi* in the Hebrew table is represented by an *s* with a dot under it (DIN-Arabic, 1982; DIN-Hebrew, 1982).

Denmark. In Denmark, the ISO tables have been implemented for the romanization of Arabic and Hebrew in automated research library catalogs, although the ALA/LC tables are used in public library catalogs. Denmark's national library, the Kongelige Bibliotek (Royal Library), uses its own romanization scheme for Hebrew, supplemented by the ALA/LC romanization tables; for Arabic, it uses ISO 233-2 with a variation in the representation of the letter tā' marbūṭah (C. Wien, personal communication, 1995). In her discussion of Arabic cataloging in Denmark, Wien (1994) points to the stumbling block that the use of the ISO standard causes to the catalogers of Arabic publications in Danish research libraries; DANbib, the Danish research library database and bibliographic utility (formerly called ALBA), has loaded files of the Library of Congress and British Library bibliographic records, but the Arabic records from these files are not useful for copy cataloging purposes because the romanization of the bibliographic data in these records needs to be redone.

Netherlands. In the Netherlands, romanization tables are administered by PICA (Project for Integrated Catalogue Automation). PICA serves as a national information network and administers the Netherlands Central Catalogue (NCC) (Feijen, 1991). PICA began as a consortium of university libraries and the Koninklijke Bibliotheek (Royal Library) in the 1980s. According to Arnoud Vrolijk, assistant curator of Oriental Collections of the Leiden University Library, the romanization tables that were developed by this consortium are not ISO-based but rather represent a compromise between the previously existing tables in use in the different libraries in the consortium. Tables presently exist for Arabic, Hebrew, Kurdish, Ottoman Turkish, Persian, and Yiddish (A. Vrolijk, personal communication, 1995).

ANSI Reversible Romanization for Hebrew

ANSI reversible romanization for Hebrew took a different approach than either the ALA/LC or the ISO tables. It mandated neither the supplying of vowels nor the use of diacritic-letter combinations to represent phonemes without equivalents in the roman alphabet. Instead, this standard provided a corresponding one-to-one character transliteration. The advantage of reversible romanization is that data can be reconverted to the original script automatically—provided that the library has terminals that can display nonroman characters (for background on reversibility within the context of the development of ANSI romanization standards, see Brandhorst, 1979).

The reversible romanization approach has had only one significant use for the cataloging of Hebrew or Arabic—the Hebraica collection of the New York Public Library (NYPL). During the years 1972-1988, the NYPL used ANSI reversible romanization for Hebrew (ANSI Z39.25 Table 4—American National Standard Romanization of Hebrew: Keypunch-Compatible Transliteration). In the late 1960s, it was decided to close the NYPL's card catalog and to replace it with book catalogs consisting of facsimiles of the cards. New cataloging would appear in book catalogs produced by photocomposition of automated data. For the inclusion of Hebrew data in the book catalogs (mostly for title and added title fields), ANSI reversible romanization was adopted for title fields, although name headings would be done in ALA/LC romanization (Malinconico et al., 1977; Filstrup, 1981). In this manner, it was possible to produce Hebrew-script output for titles in the printed catalog.

The Association of Jewish Libraries and the Council of Archives and Research Libraries in Jewish Studies proposed the adoption of ANSI reversible romanization for the automation of Hebrew bibliographic data in 1977, but this proposal was not adopted by the Library of Congress (Weinberg, 1989). When RLG first offered Hebrew script capability in its bibliographic utility (the Research Libraries Information Network [RLIN]) it was suggested to RLG that it accept reversible romanization for Hebrew data in records where data are also provided in the Hebrew script.

> Some potential users of RLIN feel, however, that once Hebrew script is available, Romanization is unnecessary and a waste of time. Some have proposed that ANSI-reversible Romanization (ANSI, 1975) be applied, rather than ALA/LC Romanization, which involves reconstruction of vowel points. This issue has been studied by RLG's Bibtech committee, which sets bibliographic standards for the network, and the decision has been made not to approve the alternative Romanization (even though the New York Public Library has already input thousands of Hebraica records using this system) because it would lead to a split in the database, i.e., records for the identical title would not "cluster," in RLIN's terms [because libraries doing romanized-only cataloging would have continued to input records with ALA/LC romanization]. (Weinberg, 1987/88, p. 18)

Because of that, records romanized according to ANSI reversible romanization (or other romanization standards) would not be considered a "standard" RLIN record. The *Cataloging in RLIN II Users Manual* states that:

> A standard RLIN record must use ALA/LC standard romanization for each of its non-Roman scripts, if such a standard has been established. Issues of the Library of Congress *Cataloging Service*

> *Bulletin* contain information about ALA/LC romanization standards. The use of any other romanization scheme prevents records from clustering together and makes record retrieval more difficult. Records containing non-standard romanization must use "9" in the second position of the CC (Cataloging Category) fixed field. (Research Libraries Group, 1991, p. 19)

Using a romanization system other than ALA/LC would have practical consequences for the library cataloging in RLIN in addition to the inconvenience created for other users by their records not clustering appropriately. Only standard RLIN records are eligible for searching rebates in RLIN (RLG, 1995).

The NYPL abandoned the ANSI reversible romanization in 1988 in favor of ALA/LC romanization with parallel Hebrew script data as soon as that capability became available in RLIN (for a discussion of current NYPL cataloging practice in RLIN, see Dienstag, 1993/94). Although the NYPL is no longer inputting Hebrew records using the ANSI reversible romanization, their previously created records with ANSI reversible romanization may still be found in RLIN. As RLIN records cluster according to romanized access points, this affects the title counts for Hebrew. According to Claire Dienstag, principal cataloger in the Jewish Division of the NYPL, approximately 2,000 Hebrew records in ANSI reversible romanization produced in-house at the NYPL were loaded to RLIN. These have no access points in LC romanization. In addition, a few hundred records were cataloged directly in RLIN by the NYPL in ANSI reversible romanization in the short time period when the NYPL had begun cataloging in RLIN before RLIN's Hebrew script capability became available. These records also have short titles in ALA/LC romanization in 799 fields. RLG has added Hebrew script data to all these records by generating it from the reversible romanization, and the NYPL is gradually replacing ANSI reversible romanization with ALA/LC romanization in these records as well, which will resolve the clustering issue when finished (Dienstag, 1995) (for further discussion about reversible romanization for Hebrew and the U. S. Judaica librarianship community, see Zipin, 1978; Weinberg, 1990/91).

It is, however, instructive to examine the reversible romanization approach precisely because it was not implemented by the Judaica or Middle Eastern librarianship communities. At first glance it would seem to have provided a very attractive solution to the problem of nonroman script cataloging at a time when automation of nonroman scripts was in its infancy. Precision could be retained during romanization because vocalization did not have to be supplied at the time of data input and ac-

cess could be given to the data in its original script (immediately via printed output, and prospectively via conversion of romanized data back to the original script) at such time as the needed hardware and software were available to the library. The major disadvantage of reversible romanization, however, was that the resulting text is very difficult to read, since it consists of a string of consonants without any vowels; moreover, some of the letters/symbols used in ANSI reversible romanization for Hebrew were not ones likely to be intuitive for the user, such as the "@" symbol for the Hebrew letter "alef." This was demonstrated in the experience of the NYPL:

> The NYPL employs a system of separate review of all data entered into the cataloging database. That is, all data entered by a keyboarder are proofread by another person to ensure quality control. This process normally works quite well with data in roman script even when the language is incomprehensible to the proofreader. It does not, however, work very well when the text is represented by combinations of characters that have no apparent phonetic value. Under those conditions proofreading is reduced to character-by-character comparisons. The probable reason is that it is virtually impossible for someone unfamiliar with the vernacular text to form *gestalts* of character combinations....At any rate, the important fact is that we had to leave proofreading to the language experts in the Jewish division. (Malinconico et al., 1977, p. 210)

The failure of reversible romanization to gain wide acceptance as a standard for Hebrew romanization—despite technically being closer to the original Hebrew in its reproduction of the Hebrew orthography—would seem to demonstrate that readability and pronounceability of romanized data are a high priority for libraries; if many libraries at that time had the option of displaying reversibly romanized data in their online catalogs in the original script, then perhaps this approach might have been more widely adopted. Romanization of Hebrew and Arabic had a long history before automation, and despite a plethora of romanization schemes used in the fields of Hebraic and Arabic studies, the supplying of vowels was a constant. Reversible romanization would have represented a major break with the past (see Appendix B, part 1 for an example of a bibliographic record romanized according to the ANSI reversible romanization for Hebrew; for the full ANSI reversible romanization table for Hebrew, see Malinconico et al., 1977).

Academy of the Hebrew Language Romanization

Israel's Academy of the Hebrew Language produced its own romanization rules for the Hebrew language. According to Elhanan Adler, assistant

director of the University of Haifa Library, its primary use for automated cataloging in Israel is for the romanization of Hebrew names in the Western-language catalogs (Academy of the Hebrew Language, 1958/59; E. Adler, personal communication, 1995).

NONROMAN SCRIPT CATALOGING

Nonroman script cataloging, as the term is used here, means the automation of nonroman script bibliographic data in its original script (i.e., in the form that appears on the title page); in the case of Hebrew and Arabic materials, this means the Hebrew and Arabic scripts. Nonroman script cataloging does not mean that bibliographic records do not contain any roman script data. Rather, it refers here to a situation where the cataloging software supports the Hebrew and/or Arabic script and the cataloging rules employed permit bibliographic data to be input in the database in the Arabic or Hebrew script without requiring that the same data also be input in romanized form in paired fields. Depending on the language of the user environment, there is a range of possibilities regarding how much nonroman data to include. It may be decided, for example, to input only the title or other descriptive cataloging elements requiring transcription by the cataloging rules while romanizing author access points and supplying subject access points and notes in English or some other roman script language. Alternately, nonroman script cataloging may go to the point of full nonroman cataloging, with author access points, notes, and subject headings in Arabic or Hebrew, with the roman script used only for descriptive cataloging of Western-language material.

Assessment of Nonroman Script Cataloging

Since the early years of library automation, there were efforts by librarians to find solutions that would make it possible to offer the patron access to Hebrew and Arabic bibliographic data in their original scripts. This naturally necessitated a proper support of the Hebrew and/or Arabic scripts in the automation environment. In some settings, automation in the original script was the only acceptable option—specifically in countries where the native language uses the Arabic or Hebrew script—in order to give users the ability to search databases using their own language and their own script. Khurshid (1992) describes the experience of the King Fahd University of Petroleum and Minerals (KFUPM) library when it tried to make use of LC catalog cards for the cataloging of their Arabic materials prior to the automation of their collections:

> To save effort and time in consulting two separate catalogs for Arabic and non-Arabic materials, integration of the two was considered

> necessary. The transliterated LC cards enabled us to interfile them with the non-Arabic catalogue cards. However, to satisfy the library patrons, who still preferred access to the collection through the Arabic alphabet, an Arabic title file was provided wherein one card in every card set was arranged alphabetically by Arabic title....
>
> The decision to adopt a transliterated system for Arabic material was taken also in view of a growing backlog of Arabic books for cataloging and the shortage of Arabic catalogers. [But it] was observed that fewer and fewer people were using the card catalog. They resented this scheme and were unwilling to learn it. In 1979, the policy was modified to drop transliteration practice in favor of vernacular script records, except for subject heading and class number, which remained in English. (pp. 244-45)

The advantages of nonroman script cataloging for Hebrew and Arabic would appear obvious. A user with knowledge of Hebrew or Arabic could approach a bibliographic database anywhere in the world without needing to be familiar with any romanization scheme and immediately be able to perform a search, and the difficulties of vocalization would not present themselves. In addition, the input of bibliographic data would require a lower level of linguistic expertise on the part of the cataloger, perhaps lowering the incidence of input errors.

The nonroman script-only solution to automation of Arabic and Hebrew does, however, have several disadvantages. First, the support of nonroman data has limited the choices of hardware and software. The international computing environment has been primarily geared toward roman script data despite the increasing trend toward internationalization. For this reason, the library automation packages supporting bibliographic data in nonroman scripts are far fewer in number than those for roman script data. Libraries requiring nonroman scripts capability in their library automation package are therefore more limited in their choice of packages than libraries without this requirement, and the packages available with this capability may not have other particular features desired by the library. For libraries in the Middle East, having the Hebrew or Arabic scripts may be the highest priority. For research libraries in the West, the cataloging needs of Hebrew and Arabic materials are far less likely to dictate hardware and software choices for libraries unless the library specializes in Judaica or Middle Eastern collections.[3] As noted by Weinberg (1989) in contrasting independent Judaica research libraries and Judaica departments of university and general research libraries: "In the former type of library, decisions on cataloging and classification policy are made locally; in the latter, Judaica catalogers are constrained by the general policy of the institution" (p. 1). As more library automation packages become available which support nonroman scripts—while fully

supporting a wide range of standard library automation functions—this would become less of an issue.

Second, the nonroman script-only solution currently limits the possibility of participating in the major international bibliographic networks, foremost among them OCLC and RLIN. This is due to the fact that romanized data are required for the input of bibliographic records for nonroman script materials into the OCLC and RLIN databases—even where they also support the entry of nonroman script data in paired fields. This is because these systems are based on USMARC, which requires a romanized base in a record, and where nonroman data are subsidiary in terms of record structure. The ability to share bibliographic data is a factor of varying importance for different libraries: for a research library in the United States, for example, it may be considered vital to be able to participate in OCLC and RLIN, for libraries in the Middle East this may be of lesser concern.

Third, as discussed earlier, provision of data in Hebrew or Arabic script would only restrict use of that data for routine library functions (e.g., binding, circulation, retrieval for interlibrary loan) to staff with knowledge of those scripts. This is not a problem in libraries in countries where Hebrew or Arabic is the native language, but in the research libraries of the West, this would limit virtually all handling and processing of these materials to a small number of staff members.

Fourth, in the Western library setting, provision of remote access to library databases by patrons is now considered a very important function by dial-up, telnet, or via the World Wide Web. Even if a library were able to provide nonroman script access at all public access terminals on-site, it cannot presently guarantee that all remote users will have the appropriate software to allow the viewing of the nonroman script data. This problem presently manifests itself on the WWW; Web sites with Hebrew or Arabic script data are generally illegible to users without web browsers designed to support those scripts, such as PMosaic for the Arabic script. This is likely to cease to be an issue in the future with the globalization of the WWW, and should, it is hoped, also cease to be an issue for libraries in the provision of remote access to nonroman script data.

Fifth, in the case of the Hebrew language, there is an additional problem related to its orthography. In Hebrew, the long "i" and "u" vowels may be represented by the letters *yod* and *vav* respectively (full form—*ketiv male*), or they may be omitted in the same way as the short vowels (brief form - *ketiv haser*) (Va'ad, 1955). Adler (1991) explains that:

> While searching by Romanised access points presents no special problems (other than correct Romanisation), searching under vernacular Hebrew headings leads to a basic problem in vernacular Hebrew cataloging...: the orthographic form of Hebrew access points. Hebrew can be written in full form (*ketiv male*), brief form (*ketiv ḥaser*) or an inconsistent mixture of both (unfortunately quite common). Simply entering the data in title page form...will create a situation in which the vernacular access points will be highly misleading. To be sure of locating all material it would be necessary either to enter a complicated Boolean search (assuming one can guess all likely variations), *or* to search under the Romanised form. I suspect that in this situation most knowledgeable users would prefer the latter. Less experienced users would simply be misled and find only part of the material they seek. (pp. 216-17)

The resulting retrieval problems can be likened to those occurring when trying to do searches on databases containing data with both American and British spellings—e.g., color/colour. The solution to this problem devised by Israeli libraries has been to "normalize" the spelling of title access points, reducing the spelling to *ketiv ḥaser* form regardless of the spelling on the title page (Adler, 1989). The title page form is transcribed in a nonindexed field, and cross-references are often made for *ketiv male* to *ketiv ḥaser* (E. Adler, personal communication, 1994). Hebrew-script cataloging as implemented in Israeli libraries therefore requires cataloger expertise for text normalization, much as is required for the supplying of vowels in romanization. Moreover, this approach of normalization of Hebrew script data means that some text is double-keyed (indexed normalized form, nonindexing full form)—whereas romanization would only require a single keying of the data. Another approach to the problem is to have users do internal truncation using wildcard characters, but this too requires an understanding of Hebrew orthography/vocalization on the part of the user in order to be aware of the need to do such truncations.

It should be pointed out that while there are many variants in Yiddish spelling—i.e., *Idishe* versus *Yidishe*, *unzer* versus *unser* versus *undzer*—these variants appear equally in the Hebrew script and romanized forms. Regardless of the data standard, it may be necessary to perform multiple searches in order to locate a Yiddish item, and therefore romanization does not perform the same homogenizing function for Yiddish that it does for Hebrew.

Nonroman Script Implementations

There have been a number of implementations of the nonroman script-only solution for automated library systems accommodating Arabic, Hebrew, or both. Most of the sites of these implementations have been in the Middle East.

CDS/ISIS and MINISIS

The ISIS-based systems CDS/ISIS and MINISIS represent the most widespread platforms for automated Arabic-script bibliographic data in the Middle East. ISIS was first developed as a mainframe database application in the 1960s at the behest of the International Labour Office (ILO) in Geneva, which then shared this application with other UN agencies including Unesco, which adapted it for its own use. ISIS was primarily used for the internal bibliographic control of documents and publications of these agencies. The Industrial Development Centre for Arab States (IDCAS) acquired ISIS from the ILO in 1974 and developed an arabized version of this package for its Data-Base on Arab Industrial Development Information, although it does not appear that ISIS-Arabic was implemented elsewhere. As Madkour (1980) reports: "This application...remains unique in the Arab region" (p. 27). When the ILO ceased using ISIS in 1977, they passed control of the package to Unesco. Unesco renamed the package CDS/ISIS, as it was their Computerized Documentation Service (CDS) that was responsible for its support, and began distributing it free of charge to nonprofit organizations (Pobukovsky 1980; 1985; Hopkinson, personal communication, 1995).

The International Development Research Center (IDRC) in Canada subsequently developed MINISIS, also based on ISIS, to run on the Hewlett-Packard 3000 series of minicomputers. IDRC for some time distributed MINISIS free of charge to institutions in the Third World. Terras Gavin director of Software Development & Applications of the Information Sciences and Systems Division of the IDRC, explains:

> In order for our MINISIS Resource Centres to be able to cover their costs for disseminating and supporting the software, we are permitting them to charge a fee for the software and support services. The fee structure which we have developed varies depending upon the economic situation of the country, the type of organization that is acquiring the software and the maximum number of simultaneous users of one copy of the software....while the software is no longer free, we have tried to keep it accessible to those organizations that need such a tool. (T.A.G., personal communication, 1995)

MINISIS was originally modeled on the UNISIST Reference Manual format with four-character alpha-numeric tags. As a result of input from the international library community, enhancements were made to MINISIS to allow it to handle MARC format data both for input and output (Avram, 1985).

In 1985, a microcomputer version of CDS/ISIS (Micro-CDS/ISIS) was released by Unesco to run on MS-DOS machines (Hopkinson, 1995a).

Micro-CDS/ISIS too was upgraded as the result of user requests to allow it to accept 3-digit tags so that it would be compatible with the MARC format.

The MINISIS software now also operates in the UNIX, VAX, and PC environments (T. A. G. Gavin, personal communication, 1995). This means that MINISIS users are now not tied to a particular machine or operating system as they were initially. MINISIS is able to handle a wider variety of data types than CDS/ISIS, including images, and it has a greater data capacity than CDS/ISIS, handling fields and records up to 16 gigabytes in size. MINISIS also has a relational database structure which allows it to fully support authority files and multilingual thesauri, whereas CDS/ISIS is a flat-file database (B. McKercher, personal communication, 1995). Alan Hopkinson, systems librarian at Middlesex University, points out, however, that Micro-CDS/ISIS does have the ability to support links between records within the same database, so that it is possible to simulate a relational structure to a certain extent (A. Hopkinson, personal communication, 1995b).

Both CDS/ISIS and MINISIS were designed to accommodate a variety of coding schemes and multiple character sets. The English, French, Spanish, Chinese, and Arabic character sets are distributed with MINISIS; other character sets may be defined by the user. Multiple character sets may be used within a single record and within a single field in MINISIS. The basic MINISIS package comes with interfaces for English, French, Spanish, Chinese, and Arabic; other interfaces can be created by the user (Kirkwood, 1992; B. McKercher, personal communication, 1995).

Gavin (1994) points out that MINISIS was designed with international usage in mind:

> The MINISIS software was designed in such a way that all prompts, error messages and command syntax are independent of software. No messages or text are imbedded in the code. This permits the dialogue, error messages and syntax to be translated into any language and used selectively by the software. This allows, for example, an English speaking user and a Spanish speaking user to be using different terminals simultaneously to access the same database using exactly the same copy of the software. (p. 161)

An arabized version of MINISIS was developed at the Arab League Documentation Centre (ALDOC) in Tunis in 1982 as was an arabized version of Micro-CDS/ISIS later. The PC version of MINISIS is now being arabized by ALDOC. Tarek Gsouri, of the Data Bank al-Farabi of the Arab League Educational, Cultural and Scientific Organisation (ALECSO) in Tunis, reported that the arabized PC version of MINISIS was being beta-tested at the Centre National de Documentation Agricole

in Tunisia under the supervision of ALECSO (T. Gsouri, personal communication, 1995). ALDOC, now in Cairo, continues to support and distribute MINISIS and CDS/ISIS and sponsors an Arab MINISIS Users' Group. The CDS/ISIS arabized by ALDOC is version 2.3; the current version 3.07 has not yet been arabized by ALDOC, although the base version is being used at King Fahd University of Petroleum and Minerals (KFUPM) with Arabic support, according to Abdus Sattar, Chaudhry, senior manager/director of Training, Library Affairs, at KFUPM (personal communication, 1995).

CDS/ISIS and MINISIS have achieved widespread popularity throughout the Arab world, as throughout the Third World, in large degree due to the fact that the software has been available free or inexpensively and runs on common hardware platforms. According to Tedd (1994b), MINISIS "has about 500 users world-wide of which about 70 are in Arab countries" (p. 297). In Jordan, for example, Younis (1993) found that, in a survey of 30 automated Jordanian university, community college, public, special, and school libraries, 18 libraries (60%) used CDS/ISIS and 3 (10%) used MINISIS, with 9 (30%) using self-developed software. The national libraries of Iraq, Morocco, and Jordan use CDS/ISIS (with the latter planning to migrate to MINISIS), and that of Saudi Arabia uses MINISIS (Itayem, 1994).

According to H. Gharibi, director of the Iranian Information & Documentation Center (IRANDOC), CDS/ISIS is also the most common library automation software in Iran. IRANDOC—the official distributor of CDS/ISIS in Iran—has adapted CDS/ISIS to support Persian by creating external interrupt routines to allow for input, storage, and sorting of Persian bibliographic data (H. Gharibi, personal communication, 1994). Ghaebi (1995) provides an analysis of various library automation software packages, including the degree of their support for the Persian language and script.

In Pakistan, the Netherlands Library Development Project (NLDP), in collaboration with the Pakistan Library Association (PLA), has developed a fully-integrated library automation software package based on CDS/ISIS—i.e., the Library Automation and Management Program (LAMP). LAMP has been released in both English and Urdu versions, containing modules for acquisitions, cataloging, authority files, circulation, and management reports. According to Riaz Khan, National Representative-Pakistan of the NLDP, the Urdu version handles Urdu data only, not mixed Urdu and English data. This is because LAMP does not

incorporate a separate [illegible] character set—i.e. the lower 128 characters of the code set (usually reserved for ASCII—roman character data representation)—are used for Urdu character representation. The printing function for Urdu is still under testing. LAMP presently does not support the MARC format, although there are plans for it to do so in the future (Hopkinson, 1995b; Khan, personal communication, 1995).

There are two major installations of MINISIS outside of the Middle East that support or have supported Arabic—the library of the Institut du Monde Arabe (IMA) in Paris, and the Canadian Multilingual Biblioservice (the latter will be discussed later in the section on combination romanized/nonroman script cataloging). The IMA implemented the arabized version of MINISIS in 1983 (Peccatte, 1987). As a combination research library, public library, and showcase for the Arab world, it is perhaps not surprising that the IMA placed high priority on providing access to Arabic materials in the Arabic script. Arabic and Western language materials are kept in one online bibliographic file that may be searched using an Arabic or French interface. According to Mahieddine Roumili, head of the IMA's Computer Department, the data are stored in a local format that is a subset of MARC but which can be output as MARC records. Arabic-language data are stored in the Arabic script only; there is no provision of parallel romanized data (M. Roumili, personal communication, 1995).

While MINISIS and CDS/ISIS both support versions of MARC, MARC is not the bibliographic format most commonly used in the CDS/ISIS and MINISIS sites in the Middle East. For example, a survey by Al-Shorbaji and El-Bacheat found that CCF (Common Communication Format)—a data exchange format developed under the auspices of Unesco's General Information Programme (PGI)—is the most commonly used bibliographic data format used in Jordanian libraries followed by CCF-based formats such as ALDOC and CEHANET (Al-Shorbaji & El-Bacheat, 1992).

While the obvious advantage of both CDS/ISIS and MINISIS is that they represent a low-cost way to automate—allowing many libraries the opportunity to automate that would not otherwise be able to do so, there is a consequent tradeoff. Because of CDS/ISIS's and MINISIS's origins as database software for bibliographic control of documents and publications rather than specifically as library automation software, not all library automation functions are presently supported by these packages. Institutions therefore either have to invest their own resources for development of the desired functions or features or wait for the sponsoring

agencies to develop the desired capabilities, as opposed to acquiring a commercially developed fully integrated system with the desired functions or features but at a considerably higher price. As of this writing, an acquisitions module is not yet available with CDS/ISIS or MINISIS, although some institutions have adapted this package for acquisitions functions (A. Hopkinson, personal communication, 1995). According to Bob McKercher (personal communication, 1995), outreach officer for Asia in IDRC's Information Sciences and Systems Division, circulation and serials check-in modules, however, are now available for MINISIS, and IDRC is in the process of developing a fully integrated library system (MINISIS ILS) based on MINISIS. MINISIS ILS is planned to accommodate both MARC and non-MARC data in order to fulfill the needs of libraries using MINISIS, including acquisitions, circulation, cataloging, and OPAC functions (MINISIS ILS, 1994). As CDS/ISIS "includes a Pascal compiler and facilities to write a program and interface it to the existing system" (Buxton & Hopkinson, 1994, p. 133), many institutions have written programs to add particular functions to CDS/ISIS, often sharing these programs with other institutions.

DOBIS-LIBIS

Arabized DOBIS/LIBIS is another well-known arabized library automation software package. In the mid-1970s, the King Fahd University of Petroleum and Minerals in Saudi Arabia began planning for library automation. It was looking for a fully-integrated library automation system that would support Arabic. While no such system existed on the market at the time, KFUPM chose in 1980 to adopt DOBIS/LIBIS (a library automation software package developed jointly by the University of Dortmund in Germany and the Catholic University of Leuven in Belgium and marketed by IBM [Khurshid, 1994]) and to do the arabization themselves. Khurshid (1994) states that:

> Of the systems investigated, DOBIS was found to be the most suitable to our requirements [fully integrated, MARC/AACR2 and IBM compatibility, distributed access and multiple language capability]. Moreover, it was the least expensive, and vendor support was also available locally. The system's multi-lingual capability was considered to be quite appropriate for adapting to Arabic. (p. 112)

As the majority of KFUPM's collections was Western-language material, priority was given to the implementation of the basic DOBIS/LIBIS package and retrospective conversion of Western language materials. Development of the DOBIS/LIBIS Arabic capability for cataloging and catalog search functions took place in 1986-1987 (while the arabized version of MINISIS appeared before the arabized version of DOBIS/LIBIS, it

did not yet exist when KFUPM was doing its initial automation planning). After the development of Arabic capability, the Arabic data were maintained in a bibliographic file separate from Western-language data (for a discussion of the development of arabized DOBIS/LIBIS at KFUPM, see Khurshid, 1992a, 1992b). For detailed comparisons of the capabilities of DOBIS/LIBIS and MINISIS, see Chaudhry & Ashoor, 1990; Ashoor & Chaudhry, 1994.)

By taking on the development of Arabic capability, KFUPM was committing a large investment of staff resources both to up-front and ongoing development of the software. Ashoor points out that at KFUPM "it took...two man-years or approximately 2,790 hours to complete all the Arabization requirements" (Ashoor, 1989a, p. 301). (There was also some prior arabization work done on DOBIS/LIBIS by King Saud University, and some subsequent arabization work—later abandoned—done on DOBIS/LIBIS by the Saudi Institute of Public Administration.) Moreover, once an institution undertakes the commitment to do extensive software modification—such as arabization—it then commits itself to the inevitable ongoing development that will be required as needs change, demands increase, or new versions appear of the base software.

IBM saw the potential for increasing the market for DOBIS/LIBIS in the region and signed a study contract with KFUPM (Ashoor, 1989b). This study contract included the right for IBM "to distribute the Arabised programs to the DOBIS/LIBIS user libraries in Saudi Arabia and Gulf countries free of charge" (Khurshid, 1992b, p. 121). Various arabized versions of DOBIS/LIBIS are in use at sites throughout Saudi Arabia. According to Brenda E. Bickett, Arabic Materials specialist in the Georgetown University Library, Arabized DOBIS/LIBIS has also been implemented at the Sultan Qaboos University Library in Oman (B. E. Bickett, personal communication, 1995). It was implemented at the International Islamic University Library in Malaysia for its materials in Arabic and other languages and also has the potential to be used for Jawi (the Malay language written in Arabic script) (A. S. Chaudhry, personal communication, 1995). Moreover, according to Lesley Wilkins, associate director of the American University in Cairo (AUC) Library, DOBIS/LIBIS was chosen for automation of the AUC library in part because of the existence of its Arabic capability, although its Arabic capability was not ultimately implemented at AUC (L. Wilkins, personal communication, 1995).

Within the context of the arabized DOBIS/LIBIS user community, work has proceeded on the development of an ARABMARC, which would be

appropriate to local cataloging needs. JAPANMARC may serve as a model as a MARC format designed to deal with a nonroman script as the primary script for cataloging (Al-Muhtaseb et al., 1994). DOBIS/LIBIS itself uses "a super set of the MARC format called DOBIS MARC (DMARC). Designed as a MARC exchange format, it includes additional fields required for circulation control, acquisitions support, and serials control" (Saffady, 1994a, p. 203). The MARC tags are hidden from the user, however, and cataloging is done via a series of menus and verbal prompts (Brophy et al., 1990).

Even without the development of Arabic capability, DOBIS/LIBIS requires a commitment of significant staff time and expertise, because it is not a turnkey system. Chaudhry and Ashoor (1990) report that:

> IBM only provides the DOBIS/LIBIS software and the user has to assume full responsibility for system installation and staff training. The local IBM office can be consulted only on major system problems. This lack of support and training on the part of IBM has always been a major criticism of the DOBIS/LIBIS Users' Group. Any library venturing into applying DOBIS/LIBIS has to have sufficient data processing support to be able to implement the system. (p. 123)

Chaudhry and Ashoor go on to say in the same article that IBM support for installation and training in DOBIS/LIBIS was beginning to improve. IBM, however, subsequently discontinued all support of DOBIS/LIBIS. A company named ELiAS (Extended Library Access Solutions) took over development and marketing rights of DOBIS/LIBIS in 1993. The ability of ELiAS to maintain and expand the customer market base of DOBIS/LIBIS will be important for the future of the arabized DOBIS/LIBIS installations if this is to continue to be a viable platform in the changing world of library automation.

The Arabic character set that is implemented in the arabized versions of MINISIS and DOBIS/LIBIS is ASMO 449. Its sponsoring organization, ASMO (Arab Standards and Measures Organization), no longer exists, but the Arab Industrial Development and Mining Organization (AIDMO) has been chartered with ASMO's responsibilities and is responsible for the maintenance of this standard. ASMO 449 is built on a previous standard—CODAR-U.

> In 1982, certain modifications were introduced to CODAR-U and it was renamed as CODAR-UFD (Unified Arab Code—Final Version). In October 1982, additional minor inconsistencies were eliminated by the efforts of the Arab Organization for Standardization and Meteorology (ASMO). The final version of CODAR-UFD resulted in ASMO 449/1982 which was the product

> of cooperation between ALECSO and the Institute of Studies and Research for Arabization in Morocco. (Ashoor, 1989b, p. 22)

The ASMO 449 standard includes only the characters needed for the Arabic language itself and does not include the additional characters needed for Persian, Urdu, and other Arabic-script languages (for the ASMO 449 character set, see Aman, 1987).

ALEPH

In Israel, all major research libraries use ALEPH, a fully integrated multiscript library automation system. Initially ALEPH was developed at the Hebrew University of Jerusalem and was later developed and maintained by the company ALEPH-YISSUM Ltd., owned by Hebrew University, and was marketed outside of Israel by Ex Libris Ltd. ALEPH-YISSUM and Ex Libris merged in the beginning of 1996 to form Ex Libris 1996 Ltd. According to Barbara Rad-El, system librarian at Ex Libris, the new company, Ex Libris 1996, will develop and market the ALEPH system worldwide (B. Rad-El, personal communication, 1995).

ALEPH was developed over several platforms. It was first implemented on a mainframe computer at Hebrew University, but:

> During the early 1980's, as part of an initiative to implement a national network of university libraries, the Israeli government subsidized the participation of other university libraries in ALEPH. From its inception, ALEPH was intended to support a network of Israeli libraries. In the mid-1980's, the Hebrew University decided to redevelop ALEPH for VAX minicomputers. The VAX implementation, which became available in 1987, permitted a distributed network of multiple processors installed in individual libraries as an alternative to a centralized system serving all participants from a single mainframe. A third ALEPH implementation, for UNIX-based computers, was introduced in 1991. (Saffady, 1994b, p. 215)

A version of ALEPH was later developed for microcomputers—PC-ALEPH—which did not support full circulation, acquisition, and serials functions (Sever & Branse, 1990; Panzer, 1992). PC-ALEPH, however, is no longer supported by Ex Libris (B. Rad-El, personal communication, 1995) (for a detailed history of the development of ALEPH and the Israeli ALEPH network, see Adler, 1982, 1985, 1986/87; Lazinger, 1991; Levi, 1984; Panzer, 1992; Roitberg, 1990). ALEPH currently provides World Wide Web (WWW) and Z39.50 service, although nonroman scripts are not yet available by web access (B. Rad-El, personal communication, 1995).

ALEPH's nonroman script support has also gone through several permutations. Initially the Hebrew character set was provided by replacing the lowercase roman characters with Hebrew characters with roman cataloging done in uppercase letters. Subsequently two full character sets were supported such that roman fields could use the full roman character set—both upper- and lowercase—and Hebrew fields could contain Hebrew and uppercase roman characters. These solutions required a Hebrew chip, what were referred to as "hard fonts." Arabic capability was developed using a microcomputer-based terminal with a graphics card (Lazinger, 1991). This meant that Arabic script could only be read as Arabic if one was at a special workstation, which was clearly not a desirable situation if ALEPH was to be a truly multiscript (as opposed to bi-script) application. The next step was the development of soft fonts, which now allow ALEPH to handle the roman, Hebrew, Arabic, Cyrillic, and Greek scripts. The Arabic character set using the microcomputer terminal solution was an extended Arabic character set supporting the characters needed for Kurdish, Urdu, Pushtu, Persian, and Ottoman Turkish; the soft font Arabic character set has a more limited Arabic character set supporting only the extra characters for Persian and Ottoman Turkish (Panzer, 1992). It is interesting to note that romanization was also used in the context of cataloging in ALEPH in Israel; until multiple script capability was developed, nonroman or non-Hebrew script material was either romanized (Cyrillic script data, for example) or hebraicized (Arabic script data). According to Esther Bornstein, director of the Library of The Standards Institution of Israel, ALEPH presently uses the 8-bit Latin/Hebrew character set SI 1311, referenced in ISO 8859-8 (E. Bornstein, personal communication, 1995). ALEPH can be configured to support both the ALA/LC and ISO extended Latin character sets. User interfaces (referred to in ALEPH literature as "language of conversation" [Rad-El, 1994]) may also be in a variety of languages—e.g., English, Hebrew, German, Russian, Arabic, etc.).

In installations in Israel, ALEPH does not implement the MARC format, using its own local format instead. Lazinger (1991) points out that:

> where format was concerned, as in other critical decisions—such as decentralizing the database and the authority control—a conscious decision was made in Israel to sacrifice conformity to international standards to national priorities, which were to find a quick and easily implemented solution to automating Israel's multiscript university catalogs, and then to implement it. (p. 283)

According to Avner Navin (personal communication, 1995), general director of ALEPH YISSUM, in 1995 there were 42 ALEPH sites in Israel—

69 libraries in total (as some sites have more than one library). Eleven of these sites (38 of the libraries) are part of an ALEPH network of university and research library catalogs, via the Israeli university wide-area network ILAN. Any of the library databases on the network may be searched from any other point within the network (the recent upgrade of some, but not all, sites on the ALEPH network from ALEPH 2 to ALEPH 3 has, however, complicated matters somewhat for searching due to differing communications protocols and search commands between the two versions) (Adler, 1995). This uniform adoption of ALEPH by Israeli academic and research libraries has greatly facilitated data sharing on a national level. It has also resulted, however, in a lack of automation alternatives for Israeli libraries, a concern expressed by Adler (1994):

> For the large Israeli libraries there is, as yet, no alternative to ALEPH and so no matter how much dissatisfaction there may be, we will remain ALEPH users in the near future. We should not, however, be taken for granted. As technologies evolve...it is foreseeable that other systems will have Hebrew capability as well....I don't know if we will still be using ALEPH in 5 or 10 years from now. If we are, I hope it will be because we feel it is the best system available.

ALEPH has many installations in Europe, but only three have implemented its Hebrew and/or Arabic capabilities: in Spain, the libraries of the Escuela de Estudios Arabes of Granada and of the Instituto de Filologia of Madrid—both libraries within the network of the Spanish Consejo Supérior de Investigaciones Científicas (CSIC), and in Italy, the Pontifical Salesian University Library. These libraries have adopted a mixed record, with some access points in the original Hebrew or Arabic script (particularly titles) and some in romanized form (particularly author and subject). According to Teresa Malo de Molina, chief of the Professional Coordination Service of the CSIC's Library Coordination Unit, the CSIC libraries do not provide parallel romanized data, although catalogers also provide a translation for the title in an added title field (Malo de Molina, personal communication, 1995). The Pontifical Salesian University Library, on the other hand, does also provide nonroman script fields with parallel entries in romanized form according to Josef Tabarelli, system manager of the Pontifical University Library (J. Tabarelli, personal communication, 1995). ALEPH was also recently implemented at a library in Egypt with an Arabic interface. None of these sites use the MARC format. In addition, four sites in the United States have implemented the Hebrew (and in one case Arabic) capabilities of ALEPH for combination romanized/nonroman script cataloging—with both romanized and Hebrew/Arabic script data—as will be discussed further below.

ALEPH can take USMARC records and convert them into ALEPH format. According to Judith Levi, librarian/analyst in Ex Libris 1996 Ltd., ALEPH records can also be converted to USMARC, although the resulting provision of tags, indicators, and fixed field data will depend on whether the information has been input in the original ALEPH record (J. Levi, personal communication, 1996). The USMARC interfaces to OCLC and RLIN have not yet, however, been successful. RLG is currently working with the Jewish National and University Library (JNUL) and the Center for Judaic Studies of the University of Pennsylvania to make this conversion possible (JNUL functions both as the national library of Israel and the university library of the Hebrew University in Jerusalem). When this has been accomplished, JNUL Hebrew records (along with Western-language Judaica) will be loaded to RLIN thereby making them the first nonroman script-only records in the RLIN database since no paired romanized fields will be provided. These records will therefore cluster separately in RLIN, much as the NYPL records in reversible romanization (J. Eilts, personal communication, 1995).

VTLS

A more recent addition to the Hebrew/Arabic library automation scene is VTLS which, as of 1994, accommodates bibliographic data in those scripts. VTLS is a fully integrated library automation system, which runs under Unix on Hewlett Packard, IBM, and Digital servers, and which supports a variety of clients running under Microsoft Windows. VTLS supports Arabic and Hebrew via the VTLS client called EasyPAC, which gives point-and-click access to online catalogs. VTLS uses USMARC records with bibliographic data held in fields in romanized form with parallel nonroman script data. However, EasyPAC is set up to allow the primary MARC fields to be defined either for the romanized version of data or for the nonroman script data. This system is therefore appropriate both in a Western setting and in a Middle Eastern one. When the nonroman script field is defined as the primary MARC field and the romanized one as the parallel field, the romanized data do not have to be input if the institution does not have need for it (J. Bazuzi, personal communication, 1995).

The RLIN Arabic and Hebrew character sets have been implemented in VTLS. However, while the RLIN extended character set for Arabic has been implemented for data storage (including Farsi and Urdu characters), because of the limits of the Arabic Windows 3.1 environment under which the VTLS system has been running, only the basic Arabic character set can be displayed. This situation applies to the display of the

Yiddish digraph characters as well. This problem is expected to be resolved with the release of the nonroman script extensions for Windows 95 (J. Bazuzi, personal communication, 1995). Another problem related to the Hebrew Windows 3.1 environment under which the system currently runs is that the diacritics and special characters needed for other roman-script languages other than English do not display although they can be stored in the database. For example, accents in a French parallel title in a Hebrew record will not currently display correctly because the display device cannot handle more than one code page at a time (there is, however, a French/Arabic Windows 3.1, so that it would be possible to display records with the Arabic script as well as accented French—and any other roman script languages using the accents supported by the code page that it uses). For these same reasons, while a VTLS database can currently contain records in multiple nonroman scripts, it can only display one nonroman script—along with the roman script—in a single Windows session. Jack Bazuzi, vice-president of VTLS, explains that the next generation of VTLS's library automation system—Virtua:

> [Virtua] will support all languages with code pages in Windows 95....Virtua is designed to support Unicode for input and display purposes. In addition, VTLS is providing a fifth layer of character set manipulation in the client. This is done in order to override Windows 95 code page restrictions. This will be particularly useful for multiple script support without having to switch code pages. (J. Bazuzi, personal communication, 1996)

Hebrew and Arabic user interfaces are available with VTLS, allowing the user the choice of screen headings, user prompts, and so on following on VTLS's tradition of multilingual interfaces. Roman and Hebrew, and roman and Arabic data coexist in the same data file and can coexist in the same record or field. For index sorting, roman headings sort according to roman sequencing rules, and Hebrew or Arabic sorts according to its own sequencing rules; roman data sorts before Hebrew or Arabic data (Chachra, 1994a, 1994b).

VTLS has been implemented with Arabic script capability at the Kuwait University Library, the Kuwait Institute for Scientific Research (KISR), the Egyptian National Agricultural Library (ENAL), and the Koleo Agama Sultan Zainal Abidin (KUSZA) in Malaysia, and is in the process of being implemented at the United Arab Emirates University Libraries (J. Bazuzi, personal communication, 1995) (for some discussion of the implementation of VTLS at the United Arab Emirates University Libraries, see Hirsch, 1995). VTLS has also been implemented as a nonroman

script-only system by the Jewish Public Library (JPL) of Montreal for automating its Hebrew and Yiddish (and English and French) collections. According to Claire Stern, head of Public Services at the JPL, the two main considerations of the JPL in choosing library automation software were that it should allow the provision of Hebrew script data without requiring parallel romanized data, and that the company should provide strong ongoing local support for its product (C. Stern, personal communication, 1995).

Ameritech Horizon

Arabian Advanced Systems in Saudi Arabia has developed an arabized version of Ameritech's Horizon called Al-Ufuq. This is a fully integrated library automation system including modules for OPAC, cataloging, circulation, serials control, and acquisitions. The code set implemented in Al-Ufuq is the IBM code page 864 (ASCII in the lower half and a modified ASMO 449 in the upper half of the code set), allowing the handling of Arabic and English bibliographic data; an Arabic interface has also been provided. Al-Ufuq runs on a variety of network configurations and supports a number of Unix and PC-based clients, including OS/2; Windows support is currently under development. According to Mohammad Moawad, manager of Information Services of Arabian Advanced Systems, Al-Ufuq has been implemented at four sites in Saudi Arabia: The Institute of Banking, the National Center for Financial & Economic Information, the Saudi Arab Monetary Fund (SAMF), and the Translation and Information Center (TIC); and in the United Arab Emirates at the Higher Colleges of Technology (HCT) (M. Moawad, personal communication, 1995).

Other Nonroman Script Implementations

The software listed above does not represent an exhaustive list of library software packages used in the Middle East and elsewhere that support Hebrew or Arabic script, as the focus here has been to look at the software used in academic/research libraries and to look at the most important trends in this area. There are a variety of other software packages that have been implemented with Hebrew and Arabic script support. Some of these have been commercial packages, but many others have been created or adapted to the nonroman script by institutions for their own use. When an institution undertakes self-development of software, however, it then becomes responsible for its future development as well. The automated catalog is supposed to be a tool to aid a library in its primary mission—i.e., the provision of access to information—but a library may find that in developing its own cataloging software, significant energies are being diverted from this mis-

sion, and that the maintenance of the software becomes an end in itself. Institutions must therefore evaluate the initial and ongoing costs of self development as compared with the costs of implementing a package already available for use (and the extent to which existing packages fulfill desired needs) over a period of time—e.g., five to seven years.

Many institutions in the Arab world have arabized versions of database packages for their own purposes. Among the institutions that have developed their own arabized library automation software packages are the Institute of Public Administration in Riyadh with its Ibn AlNadeem database (Al-Muhtaseb et al., 1994), the University of Jordan Library (according to Abdul Razeq Younis, associate professor, Faculty of Educational Sciences at the University of Jordon, personal communication, 1994), and the Tunisian Centre de Documentation Nationale's TANIT (Houissa, 1994). Also to be mentioned are the products of the Egyptian Regional Information Technology and Software Engineering Center (RITSEC) which developed both the AIMIS (Arabic & Islamic Manuscripts Information System) database software used for cataloging the manuscript holdings of the Egyptian national library Dar Al-Kutub (Tedd, 1994a); as well as the LIS (Library Information System) library automation software—developed along with the Cabinet Information & Decision Support Center (IDSC). The IDSC has implemented the LIS package in its library, as have the Cairo Public Library and the libraries of several Egyptian ministries (IDSC, 1995; RITSEC, 1995). A version of TINlib, produced by IME Ltd., has been marketed and sold to several sites around the world for its ability to handle the Arabic script but reportedly has difficulties in handling the graphic expression of the Arabic script (Wien, 1995). The National Scientific and Technical Information Center (NSTIC) in Kuwait arabized the STAIRS package (Khalid, 1983; Ashoor, 1989a). Soutron was arabized by the Public Technical Library in Muscat, Oman, "with the assistance of consultants from the University of Huddersfield" (Al-Anzi & Collier, 1994, p. 401).

A number of other commercial library software packages handling Hebrew also exist. According to Dalit Shickman, computer consultant for the School of Library, Archival and Information Studies at the Hebrew University of Jerusalem, in Israel, several are in use by public and school libraries: LMS Plus (originally called Sifria 83), developed by TOP Systems; Sefer, produced by Siphrat; and The Electric Library, produced by Sapphire Information Systems (D. Schickman, personal communication, 1995). LMS Plus was adopted by Israel's Center for Public Libraries in 1988 as its officially recommended library automation software (Sever & Branse, 1990); currently all three of these packages are recommended by the center—now

known under its new name, the Center for Libraries (E. Adler, personal communication, 1995). Schrijver reported in 1991 that the Davka Corporation of Chicago's Safran Davka software was being used on a Macintosh platform by the University Library of Amsterdam's Bibliotheca Rosenthaliana to catalog its collection of Hebraica, both to serve as an online catalog and to prepare a printed catalog of its collections (Schrijver, 1991). Safran Davka was produced on both PC and Macintosh platforms but is no longer on the market. The Leo Baeck College Library in London uses a privately developed database program created with Clipper running on a DOS platform, which handles roman, Hebrew, and Greek script bibliographic data, according to P. W. van Boxel, librarian of the Leo Baeck College Library and Joop van Klink, the program's creator (P. W. van Boxel, personal communication, 1995; van Klink, personal communication, 1995). The Hebrew Paleography Project of the Israel Academy of Sciences and the Institut de Recherches et d'Histoire des Textes of the French Centre National de Recherche Scientifique (CNRS) has created a database of Hebrew manuscripts called SFAR-DATA using dBase on a PC platform (Beit-Arié, 1991).

At the Center for Contemporary Middle East Studies of Odense University in Denmark, a project is being undertaken to provide Arabic-script cataloging data for Arabic holdings. A 4D database on a Macintosh platform is being created to hold the Arabic script data only; ISO romanized data are provided for these materials in Odin, the main library catalog. According to Charlotte Wien, research librarian at the Center for Contemporary Middle East Studies, it is anticipated that the university will eventually acquire an automated library system that will accommodate Arabic and other nonroman scripts. At that time, the Arabic data will be merged with the romanized data, following the combination romanized with nonroman script data model described later in this article. In the interim, the database will be available by network access in the reference room of the library and at the center (C. Wien, personal communication, 1995).

The experience of the British Library (BL) in the creation of the online British Library General Catalogue (BLC, the automated version of *The British Library General Catalogue of Printed Books to 1975*) represents a special case. While the BL's Hebrew and Arabic printed catalogs (*Catalogue of Hebrew Books in the British Museum, Catalogue of Arabic Books in the British Museum, Catalogue of Persian Books in the British Museum*, and supplements) have not yet undergone retrospective conversion, the BL did have to deal with the question of how to convert entries in Hebrew—or containing Hebrew characters—in the BLC (along with several other nonroman

scripts) in the course of the retrospective conversion of the BLC. It was decided that records would be converted in the original script wherever possible.

> The 360 volumes of the catalogue contain entries in over 100 languages, mostly printed in their original scripts. It would have proved impractical for the library to undertake converting all scripts in entries, but by choosing the Western and African language scripts, Cyrillic, Church Slavonic, Greek, Hebrew, Maths and isolated characters from a relatively frequently occurring collection of mainly ancient characters, over 99.7 per cent of entries will be completely converted (Brickell & Kirk, 1991, p. 245)

Brad Sabin Hill, head of the Hebrew Section of the BL's Oriental and India Office Collections, explains that

> the Hebrew records in the BLC generally fall into one of three categories: (1) Bible editions, which were necessarily included in the British Library [general] catalogue, regardless of language and script; (2) Western-language books, mostly in Latin and German...bearing Hebrew "fore-titles" but not being "Hebrew books" per se; and (3) Yiddish books, which were for decades handled among Western printed books, as a European language, despite the script....Altogether there are less than 3,000...entries containing...Hebrew characters, in the BLC. (B. S. Hill, personal communication, 1995)

Two printed catalogs of Hebrew script materials have been produced with downloaded records from the automated BLC—one of all Hebrew-character entries and one of Yiddish entries alone (British Library-Hebrew, 1992; British Library-Yiddish, 1992) as well as catalogs for Greek and Church Slavonic.

The conversion of the BLC was done by Saztec Europe. Data were converted "to conform broadly with the UKMARC exchange record format...the records will not comply with the Anglo-American Cataloguing Rules which the UKMARC format was designed to be consistent with—the original catalogue entries were created using British Museum cataloguing rules—but they will allow a level of standard MARC processing" (Oddy, 1990, p. 86). While some entries have the romanized form of the title (not in ALA/LC romanization) provided in brackets following the title in its Hebrew script form, there is no romanized title access point provided in an indexed added title field. There is still a display problem to be worked out for the Hebrew script data, however; while the letters within Hebrew and Yiddish words appear in the correct order, the words themselves appear from left to right instead of right to left. Current Hebrew cataloging at the BL's Department of Oriental

Manuscripts and Printed Books continues to be done on cards (B. S. Hill, personal communication, 1995), while its current cataloging for Arabic has been automated in romanized form since the early 1980s (Van de Vate, 1986).

Similarly, when the Bodleian Library of Oxford University converted its *Pre-1920 Catalogue of Printed Books*, which was made available on CD-ROM, Hebrew, Greek, and Cyrillic character display was provided for titles in the catalog including those scripts. The accompanying guide to the CD-ROM specifies that: "The scope of the Catalogue is printed works in European languages and scripts. Manuscripts, music, and works wholly in Oriental scripts are not included" (Bodleian, 1994, p. 11).

COMBINATION (ROMANIZED/NONROMAN SCRIPT) CATALOGING

A third solution has been developed for materials in nonroman scripts—i.e., combining romanized bibliographic data with data in its original nonroman script. This approach has been taken primarily within the U.S. cataloging community. This cataloging solution is meant to retain the portability of data—i.e., USMARC-format roman script data that can be easily shared—while offering nonroman script access to users. Strictly speaking, records need not be in the USMARC format to implement the combination cataloging strategy, but this solution seems primarily to have been implemented in configurations employing USMARC. In the USMARC record, nonroman data are held in 880 fields linked to romanized fields (referred to in USMARC as "alternate graphic representation"). Linkage is done by the subfield 6 which indicates the romanized base field.

Assessment of Combination Cataloging

The obvious advantage of combination cataloging, as has already been stated, is that it combines portability and enhanced access. A romanized record is available for data exchange with any institution or network with software supporting the USMARC format. Nonroman script data are available to provide additional access points in the original script, which may be used by patrons either as their primary search tools or as secondary ones if they fail to find the desired citation using romanized access points.

One of the main disadvantages of combination cataloging is that it, by definition, presents greater cataloging costs. Bibliographic data must be keyed twice on one or more fields. The more text that is input in a catalog record,

the more time it will take to complete that catalog record and the more that catalog record will cost the library. Those libraries that choose to take this option feel that the increased cataloging costs are justified by enhanced access to the bibliographic data, but in today's strained economic circumstances, many other libraries believe that they cannot afford these additional cataloging costs, particularly if their local systems do not yet support nonroman script data. As Eilts (1995) points out:

> After decades of building a complex of standards for descriptive cataloging, subject analysis, classification, machine readable encoding, romanizations, character sets, etc., libraries in the 1990's are now looking at simplification of the cataloging process. Cataloging of materials to the full extent of these standards has become an extremely expensive operation. Libraries have been experiencing funding problems for the past two decades and have reached a point of maximizing the availability of using cataloging copy from other sources. They have now turned their attention to minimizing the amount of necessary data to maximize the productivity of their shrinking cataloging staff.

It therefore becomes a serious concern for libraries regarding how much cataloging time it will cost to add the nonroman script data to catalog records. Aliprand (1986/87) addresses this concern:

> The requirement for parallel core fields has caused some libraries to be reluctant to use RLIN's non-Roman capabilities because of "double keying"; that is, the input of the romanized equivalent of non-Roman text in a parallel field....Double keying is not necessary when a Hebrew record for the title being cataloged already exists in the RLIN database. Keying of both romanized and Hebrew vernacular fields must be done *only* for titles not in the database or when there is only a record completely romanized according to an unacceptable scheme [like ANSI reversible romanization].
>
> The RLIN system requires "double keying" only for the "core fields." The inclusion of all other paired romanized and non-Roman fields is at the catalogers option. Additional "double keying" to provide vernacular access points in the record is certainly worthwhile, even if the headings are "uncontrolled," but vernacular headings are not mandatory in the RLIN system.
>
> Every record includes a title (245 field), and almost all records include details of publication or production (260 field). The two other core fields—edition statement and series note(s) do NOT occur in every record. Edition statements occur in 15% of RLIN records, and series notes in, at most, 30% of records.... Thus, just over half the time, only the title and imprint will have to be "double keyed," and only in records for which suitable copy cannot be found in the database. The "title" is not just the title proper, but the complete title statement including subtitle, parallel title(s) and statement(s) of responsibility. (p. 12)

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Aliprand quite rightly points out that a library may choose to pair nonroman script data to core fields only—the minimalist case—but in practice, however, some libraries have chosen to provide paired nonroman data for other fields as well. This will cost more than providing nonroman paired data for the core fields alone. Lerner (1993/94) describes the range of practice by institutions doing combination romanized/nonroman cataloging in RLIN:

> These institutions [using RLIN's Hebrew script capability] have varying standards for the amount of Hebrew script data that they include in an RLIN record and the amount of romanization that they provide. Some institutions provide Hebrew script access only for the core fields that have been required by RLG (the Research Libraries Group) for full cataloging in RLIN....Others provide access in Hebrew script for main and/or added entries, notes and subject headings as well. Some institutions do not provide romanization for the statement of responsibility (subfield c of the 245 field in the MARC record) or beyond the title proper (i.e., they do not provide romanization of "other title" information in subfield b of the 245 field), and the cataloging category (CC value) must reflect the fact that these are not full-level records. The cost of providing full romanization and vernacular access is not small, but institutions participating in RLIN have made the decision to contribute to our national shared database. (p. 26)

As for copy cataloging Hebrew or Arabic materials, the copy available in RLIN may be also romanized-only records. If a library chooses to add the nonroman data to these records, it is incurring additional cataloging costs; the copy cataloger may not have to personally key the data twice, but they are doing work that would not be required if they were doing romanized-only cataloging. The only case in which cataloging costs for a given combination romanized/nonroman script record are not greater than for a romanized-only record is if a combination romanized/nonroman script record is already available for copy cataloging. If most or all of a library's cataloging consisted of copy cataloging of full combination romanized/nonroman script records, then indeed, there would be little or no added work in doing combination cataloging. However, a large percentage of bibliographic records for titles in these languages are still only available in RLIN in romanized form. As of September 1995, there were 218,663 Hebrew-language title clusters in RLIN of which 91,774 (42%) contained at least one record within the cluster which had at least its core fields provided in the Hebrew script, and 32,523 Yiddish title clusters among which were 9,258 with the Hebrew script (28%). Simultaneously, for the Arabic language there were 197,760 title clusters of which 23,396 (12%) contained at least one record within the cluster which had at least its core fields provided in the Arabic script; for Persian there were 38,928 title clusters among which were

2,416 in the Arabic script (6%); and for Urdu there were 30,168 title clusters among which were only 26 with the Arabic script (less than 1%) (J. Eilts, personal communication, 1995). Clearly some library has to make the initial cataloging investment to provide the nonroman script data. As Rush (1994) points out, the accumulated costs to libraries are considerable in making even minimal additions and/or changes to bibliographic data as a part of the "copy"-cataloging process. Although Rush is not speaking about nonroman script data, the investment in adding nonroman script data in copy cataloging is certainly significant. At the same time, it would not be very useful for an institution to provide nonroman script access only in those records for which nonroman script data are already available for copy cataloging; if patrons cannot depend on nonroman script data being available for every record, it would be necessary for them to search the romanized data in order to be certain of finding the desired item, thereby making the nonroman script data an added luxury.

As pointed out by Lerner (1993), the availability of romanized-only copy in the RLIN database does make it more feasible for libraries to do combination romanized/nonroman script cataloging.

> Most institutions hope to find at least some form of usable copy or bibliographic data to lessen the time required to romanize or key in data. It is much easier to enhance an existing RLIN record by adding vernacular fields than to input an entirely new record, and we are all grateful for the many thousands of romanized Hebraica records that currently exist in the databases. As our libraries expand Hebraica collections and acquire new materials, and as we automate our card catalogs, our need for resource sharing will grow. If libraries do not have to provide cataloging for huge bodies of material, they will be able to absorb the costs of providing enhancements such as vernacular access more easily. There is currently great variation in Hebraica cataloging practice. We need to articulate very specific and realistic standards—beyond the minimum requirements—if institutions are going to accept a cooperative solution to cataloging Hebraica. (p. 26)

However, in view of this added cost, Charles Berlin, head of the Judaica Division of the Harvard College Library, feels that:

> The need for increased cataloging productivity militates against adding nonroman script data to the romanized record. The added work that this represents would decrease productivity further at a time when most libraries are not able to catalog their Hebrew acquisitions on a current basis. Use of romanization alone will help to increase Hebrew cataloging productivity, especially as libraries are increasingly called upon to utilize resources as wisely and as efficiently as possible. (C. Berlin, personal communication, 1995)

He further notes that, in assessing the cataloging options available to Harvard for the cataloging of Hebrew:

> The disadvantages of adding the Hebrew script far outweigh the advantages. This seems to be amply demonstrated by the fact that Harvard is the only library that has managed to implement a retrospective conversion of its complete Hebrew alphabet catalogue and to continue to catalogue all of its Hebraica acquisitions on a current basis—the pioneering "cataloguing on receipt" approach introduced in the Harvard College Library by the Judaica Division. This has enabled Harvard to become the world's largest producer of romanized Hebrew automated cataloguing data—available through the OCLC and RLIN bibliographic utilities—which serves as the basis for cataloguing of Hebraica by libraries throughout the United States. (C. Berlin, personal communication, 1995)

Thus, a dozen years after the original decision, Berlin feels that the passage of time has vindicated his choice to automate in romanization, as well as his subsequent decision, difficult though it was, to continue with romanization alone even after automated nonroman script cataloging became available.

The question is not whether adding nonroman script data to a romanized record provides added points of access; rather the question is what is the degree of access gained balanced against resources that are devoted to adding that access? The combination romanized/nonroman script solution adds another aid to user accessibility but at greater cataloging costs than romanization alone because of the additional work that this involves. Since this means more cataloging time per book and therefore less books cataloged within a given time period, patron access, to materials is actually reduced rather than increased by providing nonroman script access particularly, since at the present time, most libraries are not yet able to provide this nonroman script data to their patrons but have online catalogs that support only the romanized data. In a library setting where making materials available to the patron in as timely a manner as possible is an important priority, adding the nonroman script data to the record in addition to romanization has the undesired effect of reducing productivity. Indeed, the literature of the Judaica librarianship community has long been concerned with the added effort required to provide both the Hebrew script and the romanized data to the bibliographic record, even among proponents of Hebrew script access (Weinberg, 1989; Katchen, 1989/90).

Beyond the added costs of combination cataloging, the other major disadvantage, at least currently, of combination cataloging is that few library automation systems are available on the market at this time which handle

nonroman scripts (and fewer still that specifically handle the Hebrew or Arabic script). Those libraries that have chosen to implement an online catalog with the Hebrew or Arabic script have had a very small range of choices. There are currently few libraries outside the Middle East that have implemented catalogs with this nonroman script support.

The problem is no longer one of technical feasibility—most of the issues raised in the library literature in the past regarding multiscript computing (see, for example, Tucker, 1987; Simsova & Clews, 1987) have been dealt with. Rather the question is to what extent the library automation software vendors will choose to incorporate multiscript display (and much more important, searching) in their systems. Most libraries that have undertaken to do combination romanized/nonroman script cataloging have had thus far to do their cataloging in a cataloging utility such as RLIN and download only the romanized data to their online catalog. The costs are felt by the institution immediately, but the benefits of enhanced access are mostly prospective, although some institutions may provide librarian-mediated access or direct access to their data in RLIN. It has been argued that the existence of a body of automated nonroman script bibliographic data may serve to drive the market to provide more automation options, encouraging the development of more library automation software that supports these scripts, but again, libraries have to decide whether they are willing to incur expenditures now against possible benefits in the future and, if so, within what timeframe?

On a more prosaic note, libraries will have to deal with the issue of keyboards—both for catalogers and even more seriously for patrons—both on-site and for remote access. At a DOBIS/LIBIS site in Saudi Arabia or a MINISIS site in Egypt, keyboards might be provided with Arabic and roman characters, and at an ALEPH site in Israel with Hebrew and roman characters. Such "bi-lingual" keyboards present a viable solution for specialized libraries in the West where Arabic or Hebrew represent a major priority (for example, at the Institut du Monde Arabe or the Jewish Theological Seminary). (Keyboards may be specially produced with keys imprinted with the roman and Hebrew or Arabic script characters, or roman keyboards modified by key caps or stickers.) Until now, most institutions that have implemented nonroman data in their OPAC fit within the above two categories. In the large Western research libraries, where Hebrew and/or Arabic materials are only one of several nonroman collections, providing the appropriate keyboard device would be more problematic if access is to be provided to data in several nonroman scripts. For example, the British

Library first implemented a special keyboard with LCD keytops—which changed depending on the character set in use for staff access to the automated BLC; study found that these keyboards would not hold up to the heavy use of the public reading room, so touch-screen keyboards were implemented for the nonroman script languages; staff may also use the on-screen keyboards with a mouse (Butcher, 1993, 1995). Finding an adequate input device will be very important if a library hopes to effectively provide nonroman script searching to its patrons. If a library has a catalog that supports the nonroman script for display only and not for searching, this will not be an issue as it may then use a standard roman keyboard. However, it might be presumed that nonroman script searching is to be the ultimate goal in the implementation of nonroman scripts in an online catalog as the concerns of librarians regarding romanization in the online catalog have been particularly focused on the difficulties that romanized data could present for searchers. Romanized Hebrew and Arabic data may be visually less appealing than the original script, but reading a romanized record once it is retrieved is not likely to provide much of a problem for users (this is not the case for Chinese, Japanese, Korean [CJK] records where nonroman script display, even without searching capability, is of much greater importance).

Implementation of Combination Romanized/Nonroman Script Cataloging

The first major implementation of combination romanized/nonroman script cataloging for Hebrew or Arabic was not in a local library database but in a bibliographic network, RLIN. RLIN first offered its Hebrew script capability in 1988 and Arabic script capability in November 1991 (for a detailed history and description of RLIN Hebrew and Arabic script capability, see, for Hebrew, Aliprand, 1986/87, 1989/90; and, for Arabic, Aliprand, 1992).

There was a strong interest in the development of RLIN's Arabic capability in the Middle East:

> Before the invasion of August 1990, the Kuwait Foundation for Advancement of Sciences (KFAS) had a plan for a project involving an online database for Arabic materials called ARAB WORLD ONLINE.....It was intended that for all references available in the ARAB WORLD ONLINE there should be another set of original full MARC records available in a central cataloguing utility. This is to facilitate sharing of catalogues by various Arab libraries in the Arab world. With this intent, KFAS supported the Arabisation of the RLIN cataloguing utility of the Research Library [sic] Group. All the libraries would use this facility to create original MARC

> records in the Arabic script, which could subsequently be converted by any library to form their local online catalogue.
>
> The scheme was severely affected by the Iraqi invasion of Kuwait and the Gulf war. We understand that the scheme has now been abandoned. This is unfortunate as it would have represented a great leap forward in Arabic library system development.... (Al-Anzi & Collier, 1994, p. 400)

For the visual interface in the entry of nonroman data, RLG chose to use paired fields (i.e., roman 245, nonroman 245) rather than using the 880s (see examples of Hebrew and Arabic script records in RLIN in Appendixes B-D). When bibliographic records are output in USMARC, the nonroman script data appear in 880 fields with the appropriate linkage using a subfield 6—i.e., roman 245 ‡6 880-01, nonroman 880 ‡6 245) (Smith-Yoshimura, 1994).

RLIN records may contain nonroman data in any field. "Because of the structure of USMARC non-Roman records, RLG puts edits in the RLIN online system that prevent the core fields (245 [title statement], 250 [edition statement], 260 [imprint], and 4XX [series statement]) from being entered without an equivalent romanization in the record" (J. Eilts, personal communication, 1996). These are the same fields for which Rule 1.0E of *AACR2* prescribes: "[G]ive information transcribed from the item itself in the language and script (wherever practicable) in which it appears there" (AACR2, 1978, p. 15); this rule was not, however, implemented by LC for automated bibliographic data. The Library of Congress rule interpretation for this rule (LCRI, 1984) is usually cited in this regard, although it does not explicitly deal with bibliographic data in nonroman script language but rather deals largely with special characters within roman script text. According to Aliprand (1992):

> The designers of RLIN CJK [Chinese, Japanese, Korean] had to decide whether a CJK record should be shown to a user on a Roman-only terminal, and if so, how. If AACR2 Rule 1.0E was followed, and only the non-Roman data were entered in the record, the body of the entry would be unavailable to the majority of users. Furthermore, such non-Roman records could only be exchanged with systems that had a compatible script capability. Libraries would be unable to use their own records in their local systems, for example, in an online catalog limited to Latin script.
>
> RLG therefore instituted the concept of core fields for non-Roman cataloging....When a non-Roman core field exists, the RLIN system requires that it be preceded by the romanization of its contents in a separate field (a Roman/non-Roman field pair). Core fields may also be unpaired Roman fields (e.g., English-language imprint or series title).

> The result of this requirement is an essentially complete—albeit romanized—record supplemented by fields containing the more exact non-Roman transcript. The romanized fields may be viewed on any terminal (although on ASCII-only terminals, diacritical marks, which are often part of a romanization scheme, are displayed as underscores). (p. 72)

RLG thus assured that all users would have access to all Hebrew and Arabic records while providing two cataloging options. Noncore fields, however, may be provided in romanized form, nonroman script, or in romanized-nonroman pairs (Aliprand, 1986/87). For example, a contents note could be provided in the Hebrew or Arabic script without paired romanized data if so desired. As Aliprand points out, if the data in the core fields were given in the nonroman script only, the bibliographic record would effectively be rendered unusable to the majority of RLIN users who do not have nonroman script capability (Aliprand, 1986/87). In order to view and create nonroman script data in RLIN, libraries need to have a JACKPHY Plus license. It is anticipated that Hebrew script capability will be available shortly for the new RLIN Terminal for Windows interface and that Arabic script capability will follow. Nonroman scripts are not yet available for viewing in Eureka, a patron-oriented search interface for RLIN, but "RLG is going to develop a Eureka-like interface for nonroman searching and display" (J. Eilts, 1995, personal communication, 1995).

Unlike OCLC, which maintains a single "master" record for each unique title cataloged, RLIN retains each library's cataloging as discrete records thus preserving local information. Each time an institution creates a bibliographic record in RLIN or downloads a bibliographic record to RLIN, that record is maintained, as explained by Aliprand (1992):

> The RLIN database retains all records as individual, discrete records; it does not have a "master record" structure. Each record is individually indexed, and a search may retrieve more than one record describing the same bibliographic entity. To eliminate the plethora of duplicate records, RLG introduced record clustering. Records for the same bibliographic entity are grouped together, and the record with the highest level of cataloging is used as the representative record for the group or cluster. This representative record is termed the "primary cluster member;" the other records in the cluster are "secondary cluster members." The primary cluster member is used on displays unless a particular secondary cluster member record is specifically requested.
>
> The matching process which establishes a cluster compares identifying numbers (such as ISBN and LCCN), title, and imprint; headings are not used in the clustering process (except for certain nondistinctive titles). Title and imprint are core fields, and so are present in both romanized and non-Roman representations in non-

> Roman records. Because romanized fields are used in the matching process, the title and imprint in a completely romanized record can match the corresponding romanized fields in a non-Roman record; both types of record can co-exist in a cluster.
>
> All the index points from the records in a cluster are shared by that cluster, so a search which matches an access point in any of the records in a cluster retrieves the cluster. If only one of the records in a cluster contains Arabic script, all the other, completely romanized records in the cluster will also be retrieved by a search written in Arabic script.... (p. 75)

RLG developed its own 7-bit character sets for Hebrew and Arabic. The Hebrew character set varies only slightly from SI 960 (Aliprand, 1986/87, 1989/90). For Arabic there are two 7-bit character sets. The RLIN basic Arabic character set is based on ISO 9036, which in turn is based on ASMO 449. An RLIN extended Arabic character set was also developed by RLG in consultation with the Library of Congress. This extended Arabic character set includes characters used in other Arabic-script languages that do not exist in the ASMO standard (Aliprand, 1992a; Smith-Yoshimura, 1994) (the RLIN Hebrew character set is provided in Aliprand, 1986/87 and 1989/90; the RLIN Arabic character sets are provided in Aliprand, 1992). Eilts states that: "[The extended Arabic character set] was submitted to Unicode and has been incorporated into ISO 10646/Unicode (with a couple of exceptions)" (J. Eilts, personal communication, 1995). The RLIN character sets for Hebrew and Arabic became USMARC standards for data storage in those scripts:

> USMARC specifies the use of a number of standard character sets...Hebrew, basic Arabic, and extended Arabic are...privately defined sets. The source of this private definition lies in the use of RLIN by the Library of Congress for nonroman cataloging. The Research Libraries Group (RLG) implemented these scripts as privately designed character sets specific to RLIN. (Aliprand, 1992b, p. 110)

The Library of Congress was the first user of RLIN's Hebrew and Arabic capabilities, and a number of other libraries began doing nonroman Hebrew and Arabic cataloging in RLIN as this option became available. RLIN is a bibliographic utility used for cataloging and reference purposes; its Hebrew and Arabic capabilities provided libraries with a vehicle to do nonroman script cataloging in Hebrew and Arabic. In libraries that add Hebrew or Arabic script data to their records in RLIN but do not have local catalogs supporting the Hebrew or Arabic script, these data are in most cases unavailable to patrons except via mediated librarian search. Although many libraries give their patrons direct access to RLIN via Eureka and Zephyr, it is not possible to access the Hebrew and Arabic script data in this manner. Libraries may also choose to provide direct patron access to RLIN's

nonroman script data via public-access RLIN terminals. At Yale, for example, patrons currently have access to the RLIN database through Eureka on the campus network. According to Alan Solomon, head of the Reference Department in Yale's Stirling Library, patrons can also request access to the RLIN database via the RLIN archival and cataloging support interface, but this is not a service advertised to patrons; this direct RLIN access could potentially be used for Hebrew or Arabic script access (A. Solomon, personal communication, 1996). It is hoped that, in the future, Hebrew and Arabic script access will be provided to the patron via the RLIN Terminal for Windows at selected patron workstations in the public area once it supports those scripts, according to Simon Samoeil (personal communication, 1995), curator of the Near East Collection and Leonard Mathless (personal communication, 1995), Hebraica team leader, at the Yale University Library. At New York University, in the General and Humanities Reference Department of the Bobst Library, it is planned in the near future to provide direct patron access to RLIN with Hebrew and Arabic script capability on a public workstation: Eureka is made available on the library CD-ROM network. According to Evelyn Ehrlich, head of General and Humanities Reference at Bobst Library, searching Hebrew and Arabic materials in the original script provides better access for patrons than by romanization, and, given that NYU is doing Hebrew and Arabic script cataloging in RLIN, it was considered particularly important to give some access to that data by NYU patrons (Ehrlich, personal communication, 1996).

Many librarians in the fields of Judaica and Middle Eastern librarianship consider that access to bibliographic information via romanized data is not an adequate surrogate for the original Hebrew and Arabic scripts. The added cataloging effort to provide cataloging data in the Hebrew and Arabic script has therefore been felt by many librarians as an investment toward a future time when their libraries would have online catalogs that can accommodate nonroman script data. As access could not immediately be provided directly to these data by patrons, the romanized data in the online catalog were to serve as a provisional means of access for patrons.

Brandeis University Library, for example, is one of the libraries that implemented cataloging with the Hebrew script in RLIN. When RLIN's Hebrew capability became available, Brandeis began a retrospective conversion of its Hebraica collections into RLIN despite the fact that at the time, the Brandeis University Library's GEAC system could not accommodate Hebrew script data. Retention of the Hebrew script was considered a primary requirement for the automation of Brandeis' Hebraica

collections, and it was understood that eventually Brandeis would have an online catalog that would accommodate the Hebrew script. In the interim, the RLIN database could be searched for Brandeis holdings by a librarian on behalf of patrons, although this did have the disadvantage of limiting independent patron access to information on Brandeis Hebraica holdings. Brief romanized records were input into the GEAC circulation system (Katchen, 1987/88). According to Rosalie Katchen, Hebraica librarian in the Brandeis University Library, the romanized data from Brandeis' RLIN Hebraica records have since been downloaded into the Brandeis online catalog (now DRA); the fields containing Hebrew script data will be suppressed from public display until DRA Find's Hebrew script capability is implemented at Brandeis (R. Katchen, personal communication, 1995).

Heidi Lerner (1993/94), Hebraica/Judaica cataloger at Stanford University, addresses the reasons for adding Hebrew script data to Stanford's catalog records in her article:

> Stanford University is not primarily a Judaica research institution, and my colleagues in the catalog department questioned the value and expense of adding Hebrew script fields to RLIN records. Providing Hebrew script access goes beyond current cataloging standards and seemed a luxury at a time when Stanford librarians were looking at ways to decrease access to other materials. I emphasized to them the unique problems faced by patrons searching for Hebraica materials and pointed out that Stanford has a new and expanding Jewish Studies department with a growing staff and student body who need accurate and reliable access to this body of materials.... Most public online catalogs and local library systems in the United States do not yet support Hebrew-script access, and thus Hebrew-script aceess must be provided by other means, e.g., via card files. But we are hopeful that a vernacular capability will become available in an American system within a few years. Prior to Stanford's decision to input RLIN records enhanced with Hebrew script, Stanford University Libraries had cataloged very little Hebraica; so, if and when our online catalog does support a Hebrew character set, almost our entire Hebraica collection could be retrieved through vernacular searches, and little "retrospective conversion" would be required. (p. 26)

A survey of the Hebrew and Arabic cataloging practices of libraries in the United States may provide some indications of the use of the nonroman script (see Figures 1 and 2). This survey follows and expands upon the findings of Lerner (1993) and Vernon (1991). The following was an informal study conducted by e-mail and by telephone, which grew out of the original research project to examine the implementation of automated cataloging in the Hebrew and Arabic cataloging community

Of 27 libraries surveyed cataloging **Hebrew** monographs and serials:

- 8 do combination romanized/Hebrew script cataloging in RLIN and do not yet have a local automated system: Hebrew College; Hebrew Union College—Cincinnati; Hebrew Union College—Los Angeles; Hebrew Union College—New York; Spertus College of Judaica; University of Judaism; Yeshiva University (VTLS with Hebrew capability under installation); YIVO Institute for Jewish Research.
- 7 do combination romanized/Hebrew script cataloging in RLIN and download records to a local automated system which does not support the Hebrew script: Brandeis University (DRA Hebrew script display to be implemented); Gratz College (formerly had ALEPH catalog accommodating Hebrew script); New York Public Library; New York University; Stanford University; University of Michigan; Yale University.
- 4 do romanized-only cataloging in OCLC and download records to a local automated system which does not support the Hebrew script: University of Arizona; University of California at Los Angeles; University of Florida; University of Washington.
- 3 do romanized-only cataloging directly in local automated system which does not support the Hebrew script: Columbia University; Cornell University; Harvard University—Harvard College Library.
- 1 does combination romanized/Hebrew script cataloging both in RLIN and in local system which supports the Hebrew script: Jewish Theological Seminary (copy cataloging in RLIN; original cataloging done in local ALEPH system).
- 1 does combination romanized/Hebrew script cataloging in RLIN and downloads records to local system local automated system which supports the Hebrew script: University of Pennsylvania—Center for Judaic Studies (ALEPH) (current cataloging in RLIN; retrospective cataloging done in OCLC or directly into ALEPH).
- 1 does combination romanized/Hebrew script cataloging in RLIN for monographs only (romanized-only for serials) and downloads to a local automated system which does not support the Hebrew script: Library of Congress (Hebrew script on monograph records for records in all cataloging levels; serials done romanized-only in OCLC).
- 1 does romanized-only cataloging in RLIN and downloads records to a local automated system which does not support the Hebrew script: Princeton University.
- 1 does romanized-only cataloging in OCLC, downloads records to a local automated system which supports the Hebrew script, and adds Hebrew script to records locally: Ohio State University (ALEPH).

Figure 1. Hebrew Cataloging in Selected United States Libraries

in the United States. Midway through the study, questions became more formalized, and follow-up questions were asked in order to make the results as consistent as possible. Respondents were asked: (1) if their library's Hebrew or Arabic cataloging was done in OCLC, RLIN, or their local system and, if either of the latter, whether their cataloging was romanized-only or if Hebrew/Arabic script data were added to the record; and (2) what were the library's reasons for adding or not adding Hebrew/Arabic script data to its catalog records? It was also verified whether or not the library's local system (where it had one) supported the Hebrew and/or Arabic script.

Note that in some cases institutions do their cataloging on more than one platform. The responses in Figures 1 and 2 regarding cataloging

Of 23 libraries surveyed cataloging Arabic monographs and serials:

- 9 do romanized-only cataloging in OCLC and download records to a local automated system which does not support the Arabic script: Brandeis University; Georgetown University; Indiana University; University of California at Los Angeles; University of Arizona; University of Chicago; University of Florida; University of Texas; University of Washington.
- 6 do combination romanized/Arabic script cataloging in RLIN and download to a local automated system which does not support the Arabic script: Harvard University—Harvard Law School Library; New York Public Library; New York University; University of Michigan; University of Pennsylvania; Yale University.
- 5 do romanized-only cataloging directly in a local automated system which does not support the Arabic script: Columbia University; Cornell University; Harvard University—Harvard College Library; Stanford University—Hoover Institution; University of Utah (copy cataloging in OCLC).
- 1 does romanized-only cataloging in RLIN and downloads records to a local automated system which does not support the Arabic script: Princeton University.
- 1 does combination romanized/Arabic script cataloging in RLIN for monographs (romanized-only for serials) and downloads records to a local automated system which does not support the Arabic script: Library of Congress (Arabic script on monograph records for full-level cataloging records only; serials done romanized-only in OCLC).
- 1 does romanized-only cataloging in OCLC, downloads records to a local automated system which supports the Arabic script, and adds Arabic script to records locally: Ohio State University (ALEPH).

Figure 2. Arabic Cataloging in Selected United States Libraries

categories represent, in some cases, either the dominant cataloging platform used or the platform used for original cataloging. In particular, some libraries doing cataloging in their local database may claim records from one or both of the utilities for copy cataloging. In addition, the responses in the figures represent library practices for current cataloging. Some libraries listed as doing combination romanized/nonroman-script cataloging for Hebrew or Arabic for their current cataloging also do it for retrospective cataloging and retrospective conversion; other libraries have chosen not to add the Hebrew or Arabic script to records when converting cards because of time or other technical constraints. The listing above indicating that a library is doing its cataloging in a local system or in one of the utilities (i.e., OCLC and RLIN) does not imply that the catalog records created do not appear in both of the utilities; regardless of where the catalog records are created, the library may choose to load its bibliographic data to one or both of these utilities.

Among the libraries surveyed, the combination romanized/nonroman script cataloging option was more heavily used for the cataloging of Hebrew (19 out of 27 libraries surveyed or 70%) than for Arabic (8 out of 23 libraries surveyed or 35%). Of the 19 libraries adding the Hebrew script to their records, 12 (63%) were in institutions of higher Jewish

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learning or under Jewish auspices. (This also includes the Annenberg Research Institute, formerly an independent institution of higher Jewish learning, now the Center for Judaic Studies of the University of Pennsylvania.) Of the remaining 15 university and research libraries surveyed regarding their cataloging of Hebrew materials, 7 (47%) include the Hebrew script in their catalog records; with the exception of Stanford University, these are all libraries that also do their Arabic cataloging with the Arabic script. The 8 libraries cataloging in RLIN with romanization and Hebrew script which did not yet have online catalogs (all of which are in institutions of higher Jewish learning) indicated that when their libraries did automate that it would be with a catalog that supported Hebrew script.

The most commonly stated reason given by respondents for their libraries doing nonroman script cataloging was that these institutions hoped one day to be able to provide nonroman script access in their online catalog or, in a few cases, were already able to provide it.

The University of Michigan uses RLIN's Arabic script capability for all of its current cataloging of Arabic script materials. It is hoped that once Arabic capability becomes available for RLIN Terminal for Windows, the library will provide public access to RLIN by patrons. Jonathan Rodgers, head of the Near East Division of the University of Michigan's Graduate Library, estimates that addition of the Arabic script data increases cataloging time by about one-third. The Arabic script is not being added at this time to titles done in retrospective conversion because of time constraints (J. Rodgers, personal communication, 1995).

Roberta Dougherty, Middle East bibliographer at the University of Pennsylvania Libraries, states the reasons for adding the Arabic script to cataloging records at the University of Pennsylvania as being:

> To enrich our own records in the RLIN database with vernacular-script cataloging, to assist users by providing a means of access more preferable to them than romanization, to participate in building the vernacular-script database in general. All of these goals are long-term ones, since there is no local public access to the vernacular-script records yet. (R. Dougherty, personal communication, 1995)

According to David Gilner, director of libraries of the HUC-JIR Libraries, five institutions use a program created by Hebrew Union College to produce cards for their card catalogs with the Hebrew script based on the data downloaded from RLIN: Hebrew Union College (Cincinnati, Los Angeles, and New York), University of Judaism, and Yeshiva University (now migrating to the VTLS automated system with Hebrew capabil-

ity) (D. J. Gilner, personal communication, 1995; Weinberg, 1990/91). A description of the use of the HUC card program is found in Wolfson (1993/94). Hebrew College produces Hebrew cards in Nota Bene. According to Maurice Tuchman, director of library services at Hebrew College, a typist inputs the data based on the printout of the RLIN record (M. Tuchman, personal communication, 1995). At the YIVO Institute for Jewish Research, Hebrew tracings are added to romanized-only RLIN cards as an interim solution, however, Zachary Baker (personal communication, 1996), head librarian of the YIVO Library, points to the importance of implementing a local online catalog that supports the Hebrew script in order to make their Hebrew script cataloging useful for providing bibliographic access by patrons to these materials:

> The library of the YIVO Institute for Jewish Research has always been firm in its support of vernacular-alphabet access to its Yiddish and Hebrew holdings. When YIVO joined RLG in 1992 and began doing its cataloging in RLIN, we were confronted with the fact that while one can do Hebrew-alphabet cataloging on RLIN, access to that cataloging, in the original script is possible only by searching RLIN and calling the records up on the screen (with attendant search fees), by means of an OPAC that supports Hebrew and Yiddish ..., or via a specialized card-production program, such as was devised at HUC-JIR (since RLIN produces catalog cards only in romanization). The first option was rejected by YIVO because of the high search fees involved; the second option (an OPAC) is in the planning stages; the third option (HUC card program) did not work correctly on our computers. YIVO has done some cataloging of materials in Yiddish, Hebrew and Ladino (Judezmo) since joining RLG, but because of the card problem very little of our cataloging has been for works in these Hebrew-alphabet languages. We are waiting to introduce an OPAC that will take care of that problem. (Z. Baker, personal communication, 1996)

Among respondents from institutions not adding Hebrew or Arabic script data to their bibliographic records, the most commonly stated reasons for not doing this combination romanized/nonroman script cataloging were: that they were not able to commit or did not feel that it was justified to commit, the additional cataloging resources that would be required to do the added cataloging work, and that their online catalogs could not accommodate the nonroman script data. A few respondents also reported that, since their parent institution did its cataloging in OCLC, adding Hebrew or Arabic script data during cataloging was not an option available to them.

Three of the institutions listed above as currently doing romanized-only cataloging for Arabic materials previously did pilot studies using RLIN's Arabic script capability but are no longer doing so: Harvard

University - Harvard College Library, Princeton University Library, and the University of Washington Library.

The Middle Eastern Division of the Harvard College Library did a one-year trial period of cataloging in RLIN using RLIN's Arabic-script capability for some of its Arabic material. At the end of this period, the Middle Eastern Division decided—concurrent with a reorganization of its cataloging procedures—to discontinue inputting the Arabic-script data in the RLIN record. According to Michael Hopper, head of the Middle Eastern Division, as part of the reorganization, it was decided to adopt the policy and practices of the Harvard College Library's Judaica Division of cataloging materials upon receipt to make the most efficient use of staff time and to provide the quickest access to materials for patrons. Since a large percentage of new material would require original cataloging, to create romanized and Arabic records in RLIN would almost double the work involved in cataloging an item. Furthermore, the many years of the library's experience with Hebraica cataloging in this manner demonstrated that cataloging in the local system, HOLLIS, was a more efficient means of cataloging new material, since most of this material would require original cataloging, and the cataloger could perform all the activities associated with adding the material to Harvard's collections—doing the cataloging and payment at one time—instead of doing the acquisitions work in HOLLIS and doing original cataloging in RLIN (M. Hopper, personal communication, 1995). The Harvard Law School Library does cataloging in RLIN with the Arabic script, but this is for a relatively small number of titles—about 300 titles annually (according to John Hostage, authorities librarian in the Harvard Law School Library) compared to the Harvard College Library's approximately 6,500 Arabic script titles cataloged annually (J. Hostage, personal communication, 1995; M. Hopper, personal communication, 1995). The productivity issues related to combination romanized/nonroman script cataloging are not of as great a significance when a small number of titles are involved. The larger a library's cataloging workload of nonroman script materials—both in the absolute and in relation to available resources—the greater the significance of productivity issues.

Similar to the Harvard College Library, the Near Eastern Languages Cataloging Team at the Princeton University Library chose not to use RLIN's Arabic script capability after conducting a pilot study. Kambiz Eslami, head of Near East Technical Services at Princeton University Library, explains that:

> It was indeed the additional time needed for including the vernacular script fields in the catalog records that made us go against using RLIN's Arabic script capability. The duration of our pilot study was three months. According to the findings of the study, it took

> about 40% to 50% more time to create an original catalog record with vernacular script fields than a normal romanized catalog record. Considering the high number of Arabic titles that Princeton receives each year, we obviously preferred to catalog more books than to have catalog records with additional vernacular fields. Had we had more resources and a local catalog system that could reflect vernacular script, we would have definitely added vernacular fields to our catalog records. (K. Eslami, personal communication, 1995)

The Princeton University Library's Near Eastern Cataloging Team did, however, use RLIN's Hebrew capability on a limited basis for a time; paired Hebrew bibliographic data were added to the catalog records of rabbinic materials only. This practice was discontinued at the beginning of 1996 (K. Eslami, personal communication, 1996).

The University of Washington beta-tested the RLIN Arabic-script capability but chose not to implement it for the university's Arabic cataloging. According to Fawzi Khoury, head of the Near East Section of the University of Washington Libraries, this decision was taken because of the increased time required for record input and because of the fact that the University of Washington's online catalog could not support the Arabic script, in addition to issues related to the University of Washington's standing contract with OCLC if the university's records were to be loaded on both systems. The University of Washington is, however, currently in the process of implementing nonroman script display in its online catalog (F. Khoury, personal communication, 1996).

Yoram Szekely, Jewish Studies bibliographer at the Cornell University Library, explains that at Cornell:

> The decision not to use RLIN's Hebrew capability was made a few years ago for reasons of both cost and utility. At that time I was Cornell's representative on the old JAMES group and recommended to our administration against using the Hebrew-character records. I felt that any added utility would not be significant enough to justify the extra cost. Assuming correct and consistent romanization, users familiar with Hebrew could handle the romanized records just as easily as records using Hebrew characters, while users unfamiliar with Hebrew couldn't handle Hebrew character records anyway. (Y. Szekely, personal communication, 1995)

There are presently only a few sites in North America which do combination cataloging and have online catalogs that can accommodate nonroman data as is discussed later.

ALEPH

Four libraries in the United States adopted ALEPH to provide for the automation of their Hebrew and Arabic collections: the Jewish

Theological Seminary (New York), the Annenberg Research Institute (Philadelphia—now the Center for Judaic Studies at the University of Pennsylvania), Gratz College (Philadelphia), and the Jewish and Middle East Studies Libraries of the Ohio State University Libraries (there is an additional installation of ALEPH at Princeton University for its use in Index of Christian Art, but this is not a library catalog in the sense that is being discussed here). Unlike the European ALEPH installations, these libraries work within a MARC environment—i.e., they need to be able to send records to, and receive records from, the bibliographic utilities. The JTS, Annenberg, and Gratz catalogs served as the central online catalogs of their institutions and were initially linked in a bibliographic network. JTS and Annenberg were running the full ALEPH product on a VAX, while Gratz was running PC-ALEPH. As PC-ALEPH is no longer supported by Ex Libris (B. Rad-El, personal communication, 1995), Gratz College has migrated to the Mandarin automation package, which does not support the Hebrew script, according to Sara Spiegel, library director of Gratz College's Tuttleman Library (S. Spiegel, personal communication, 1995). The network between the other two institutions was discontinued since it was found that connection by telnet was more efficient than the network connections via modem. At this time, Hebrew is the only nonroman script being used in ALEPH by JTS, but, according to Naomi Steinberger, administrative librarian for Public Services and Systems at the JTS Library, it is hoped that Cyrillic will be implemented soon and possibly Arabic at a later time (N. M. Steinberger, personal communication, 1995).

Aviva Astrinsky, library director of the Center for Judaic Studies at the University of Pennsylvania, explained that the primary factor in the choice of ALEPH as an automation system was the fact that it was the only system available at the time that had Hebrew capability, but that it also had several features that they considered desirable, such as the ability to globally update name headings and produce spine labels. Astrinsky elaborated that:

> When the Annenberg Research Institute moved to its new building in 1988, it had only 7,000 machine-readable records. Out of the estimated 150,000 titles, 75,000 were in Hebrew, and only 20,000 had some form of cataloging. To solve this problem quickly, we knew that we needed a local system in a hurry....Since we had only one trained Hebrew cataloger...ALEPH enabled us to use students to quickly import copy cataloging (usually romanized-only to be upgraded later) or key-in minimal level records in Hebrew vernacular; these records were gradually upgraded by combining them with Romanized records from OCLC and/or RLIN....
>
> We believed that computers should serve people and not vice versa. LC Romanization tables were invented in order to first cope

> with the scarcity of vernacular typewriters. Later it became a reasonable way to deal with computer technology that was totally Anglo-centric. However, now that international standards have been developed for non-roman scripts (especially Unicode) academic librarians should continue to demand that online catalogs provide them with this capability....There is no question that to search for non-roman books by using a non-roman script is the most natural and logical way to use the catalog. Romanization is second best, and we had to put up with it while the technology was evolving and standards were being developed....Since our library was conceived and designed as a closed stack library, users had to rely only on the catalog to find what they needed. As time went by, it became clear that our Israeli fellows were having a hard time searching romanized records. They kept asking why we did not have all our Hebrew and Yiddish records in the vernacular script. In fact, even older American users were having a hard time learning LC romanization tables and needed much assistance. Admittedly, this problem is less acute in an open stack library, where users often just browse the shelves to find what they want. (A. Astrinsky, personal communication, 1995)

At Ohio State University, the main library online catalog, Innovative Interfaces (III), does not support Hebrew or Arabic scripts, so Hebrew and Arabic records can be found in the III catalog in their romanized form only. The subset of Hebrew and Arabic bibliographic records is simultaneously maintained in a separate ALEPH catalog which provides both romanized and nonroman script access. Cataloging is done in romanized form in OCLC—the OCLC record is loaded to the library's main III OPAC and the ALEPH catalog; Hebrew and Arabic script title fields are added in the ALEPH catalog, and Hebrew and Arabic script name access is provided (J. Galron, personal communication, 1995).

As part of the JTS/Annenberg/Gratz contract, ALEPH YISSUM developed a conversion program to map OCLC MARC and RLIN MARC to ALEPH so that records could be imported from those databases (Steinberger, 1994). Although they have been able to import records from OCLC and RLIN successfully, the ALEPH sites in the United States have experienced problems relating to the export of records from ALEPH to these bibliographic utilities—i.e., they have not yet been able to produce USMARC records from ALEPH that can be loaded to RLIN and OCLC, an impediment in sharing their bibliographic data with the larger library community. JTS has worked and currently the Center for Judaic Studies of the University of Pennsylvania is working with RLIN and OCLC to make this possible (N. M. Steinberger, personal communication, 1995; A. Astrinsky, personal communication, 1995). Ex Libris is currently working to make ALEPH fully compatible with the USMARC cataloging environment (Levi, 1996).

While in Europe "Ex Libris [Ltd.] can supply complete turnkey solutions consisting of hardware and software," ALEPH is marketed in the United States "as software for implementation and operation on customer-supplied computer configurations, which must be approved by Ex Libris" (Saffady, 1994b, p. 216). There has been no U. S. support for ALEPH; support has been done long-distance from the ALEPH offices in Israel, which has proved cumbersome for sites in the United States (Steinberger, 1994). Ex Libris has now opened an office in the United States, and support is expected to be available in the United States in 1996 (B. Rad-El, personal communication, 1995).

At the ALEPH sites in the United States, the Israeli solution to the problem of Hebrew orthography by normalization to *ketiv haser* of bibliographic data was not implemented. For example, at the Jewish Theological Seminary (JTS) Library, according to Rita Lifton, a cataloger at JTS, the spelling that appears on the item is used (R. Lifton, personal communication, 1995). At the Ohio State University Library, according to Joseph Galron, Jewish Studies librarian, the first (and sometimes the second) word of the title is normalized to *ketiv haser* with occasional cross-references from *ketiv male* to *ketiv haser* as considered appropriate (J. Galron, personal communication, 1995).

ALEPH sites in the United States are available for consultation through the Internet via telnet. The Hebrew- and Arabic-script data, however, are only legible if the link is done with the appropriate terminal emulation. This approach can also be used to telnet to Israeli libraries on the ALEPH network in Israel.

VTLS

VTLS with Hebrew script capability is in the process of being implemented at Yeshiva University (YU) Library in New York. According to Pearl Berger, dean of Libraries at YU, the two major priorities of the YU libraries in choosing a system were that it effectively support the Hebrew script and the functions needed in the U. S. academic/research library environment (P. Berger, personal communication, 1995).

DRA

Data Research Associates has incorporated Hebrew (and Cyrillic) script display capability in the latest version of its DRA Find Z39.50 reference workstation. According to Lee Ireland, product manager for DRA, this PC-based workstation for public searching can display data in those scripts

either from the DRA database or from remote Z39.50 servers. DRA does not, however, support searching in the Hebrew script, and patrons therefore must still do their searching on the romanized access points. Hebrew display is also not available in technical services mode, therefore, an institution making use of this feature would need to continue to do its cataloging and editing of Hebrew data in RLIN and download the data to the local database. Because of its Z39.50 compliance, a DRA Find workstation can be used for performing a public search on the local database and in RLIN simultaneously, merging the search results—including display of Hebrew or Cyrillic data (L. Ireland, personal communication, 1995). Brandeis has planned to implement DRA Find, although initially only at selected terminals due to the cost of upgrading the public access terminals (R. Katchen, personal communication, 1995).

MINISIS and CDS/ISIS

The one major MINISIS implementation for combination cataloging of Arabic bibliographic data has been the Multilingual Biblioservice of the National Library of Canada. The Multilingual Biblioservice (MBS) was created as part of the National Library of Canada to provide Canadian public libraries with collections of books and audio cassettes, predominantly fiction and children's literature, in the "heritage languages"—i.e., languages other than English, French, or aboriginal languages spoken by a large number of Canadians. Thirty-two languages were covered by the Multilingual Biblioservice, of which many were in non-Roman script languages including Arabic and Urdu. Beginning in 1987, MINISIS was used to create a database of the materials circulated by the MBS. The aim was to have all bibliographic data available in the original script but with romanized author and title entries for access by people without knowledge of the nonroman scripts. Ultimately, the MBS-MINISIS database included data in the roman, Arabic, Greek, Cyrillic, and Devanagari scripts. The database was made available by dial-up access in 1991—initially for roman data only due to the difficulty of the transmission of nonroman data; nonroman script data without parallel romanization would have rendered the information effectively invisible. Eventually, the Multilib software and PC interface made it possible for Windows users to dial up the MBS-MINISIS database and see the scripts properly.

There were difficulties finding an appropriate input-output device for the MBS database. It was first thought that the Macintosh would be used as a platform because of its ability to easily handle multiple character sets and graphics (Merkis, 1988). This had to be abandoned because at the time, "it

was not possible to transmit graphics characters from the Mac to the HP3000 [the MINISIS platform]" (Ballance, 1991, p. 2). Ultimately, PCs were used as the input-output device and a Windows 3.0 interface was implemented to allow simultaneous display and entry of multiple character sets by way of the Multilib software (created by MBS and IDRC) (Ballance, 1991, 1993a, 1993b). The Multilib Windows interface developed by the National Library of Canada for MINISIS is distributed and supported by IDRC (McKercher, personal communication, 1995).

The MBS has since been reorganized and its services relating to circulating collections to public libraries in Canada are being phased out (the MBS will continue serving public libraries in an advisory capacity to assist them in building their own multilingual collections). As the MBS's collections are being donated to public libraries across Canada, there will no longer be a need to maintain the MBS-MINISIS database, although, according to Ene Kannel, Networked Information Systems analyst at the National Library of Canada, it was planned to make the database available for use at least until the end of 1995, to track materials that have been sent to deposit center libraries over the past 21 years (E. Kannel, personal communication, 1995).

CDS/ISIS is currently being used as cataloging software at the United Nations' Dag Hammarskjold Library in New York. According to Noriko Gines, cataloger in the Acquisition and Cataloguing Section of the library, materials are cataloged in the CCF format and uploaded to the library's UNBIS mainframe database where these data can be accessed via their OPAC; the library will shortly be migrating to Ameritech's LMS system and converting to the USMARC format (N. Gines, personal communication, 1995). Both the current and new OPACs support only the roman script. Arabic materials in the library are going to be cataloged in CDS/ISIS as well. According to Alissar Khoury, the Arabic resource librarian, the initial plan was to do nonroman script-only cataloging for these Arabic materials, but it was then decided that it would be more appropriate to do combination romanized/nonroman script cataloging, as this was the only way that these bibliographic entries could be available in the OPAC at this time, although it is hoped that in the future the library's OPAC will support Arabic and other nonroman scripts (A. Khoury, personal communication, 1995).

AUTHORITY CONTROL OF HEBREW AND ARABIC MATERIALS

When discussing bibliographic data, it is necessary to distinguish between two sorts of access points—those usually transcribed, particularly the title

and series, and those usually normalized, particularly author and subject. Name authority control for material in Hebrew and Arabic adds another set of issues to those discussed thus far.

Authority control is an area of special concern for libraries cataloging Hebrew and Arabic materials (Weinberg, 1993/1994; Hamdy, 1980; Houissa, 1991; Van de Vate & Bell, 1991; Vassie, 1990). The advent of the automated authority file meant that the choice of the "correct" form of the name heading—so crucial in the card catalog era and particularly problematic in the case of name headings for Hebrew and Arabic bibliographic items—became a much less onerous task. Providing a cross-reference became a matter of adding a field on an authority record; it therefore became easier to add greater numbers of cross-references, to update them as needed, and to search for, and correct, variant and incorrect headings. If good authority work is done, user searching patterns will be anticipated as much as possible, and the user should be able to find the heading regardless of the actual choice of the form of heading.

Name Authority Control in the Romanized Cataloging Environment

In the romanized cataloging environment, authority records for the names of authors of Hebrew and Arabic works are structurally the same as for authority records in any roman script language, although they are likely to carry a greater number of cross references. To enhance access, particular care needs to be taken to add references to alternate vocalizing of names where doubt may exist. Hebrew and Arabic materials share similar problems relating to the names of authors of older and classical works, where authors may not have a "first name, last name" name structure, requiring extensive cross references for variant name forms.

Name Authority Control in the Nonroman Script Cataloging Environment

In the nonroman script cataloging environment, the title and other descriptive cataloging elements are transcribed in the script or scripts that appear on the title page. This does not necessarily mean, however, that name headings will also be input in the script in which they appear on the title page. An author may have books published in several languages in several scripts. Will they all be collated under one form of the name or will a single database contain an English book under "Maimonides, Moses," a Hebrew book under "Mosheh ben Maimon," and an Arabic book under "Musa ibn Maymun"?

Different approaches have been taken. For example, at the Institut du Monde Arabe (IMA), entries for Arabic script materials have name headings in the

Arabic script, and materials in roman script languages have name headings in the roman script. A single author search, however, will retrieve all materials for an author regardless of the language because Arabic and roman script name headings are linked via an authority file. The IMA recently created an authority file/bio-bibliographic database called A'lam (together with a bilingual roman/Arabic thesaurus). Each name in A'lam has two authorized forms—i.e., one for searching in Arabic, one for searching in roman characters (where Arabic names are romanized to provide the roman form, an adaptation of ISO 233-2 is used) (Descamps-Wassif, 1995). At King Fahd University of Petroleum and Minerals, records for Arabic and Western-language materials are kept in two separate online files. There are therefore two separate authority files for the DOBIS/LIBIS, one for the Arabic bibliographic file, and one for the roman script bibliographic file (A. S. Chaudhry, personal communication, 1995). ALEPH has the capability to include Hebrew and roman script in one authority record. Although the ALEPH network links all major bibliographic institutions in Israel, there is no national authority file; each institution on the ALEPH network maintains its own authority files (Lazinger, 1991). In the third edition of the cataloging manual *ha-Kitlug*, published by the Israeli Center for Libraries, Adler, Shichor, and Kedar (1995) provide a list of Judaica uniform title headings in Hebrew as used in Israeli university libraries.

Name Authority Control in the Combination Romanized/Nonroman Script Cataloging Environment

Although name access points perhaps represent the bibliographic elements that could most benefit by nonroman script access for Hebrew and Arabic materials, the provision of nonroman script name access points has not yet fulfilled its potential in the combination romanized/nonroman script cataloging environment.

For name access points to be effective, there needs to be a uniform version of the name provided that will allow all works in the database to be called up using a single heading; the authority file makes it possible for the cataloger to consistently choose a single heading for all of an author's works, regardless of the way the author's name appears on the item. This is as true for nonroman name headings as it is for romanized ones. Provision has been made in the USMARC format for authority data for nonroman scripts in authority records. However, the Library of Congress is not currently creating authority records with added entries in Hebrew or Arabic scripts. Therefore, mixed-script authority records are not yet available in RLIN, where most libraries are doing their Hebrew and Arabic script cataloging. ALEPH and VTLS do allow mixed roman/nonroman script authority records, and therefore libraries with these

systems have the option to enhance their authority records locally with Hebrew or Arabic cross-reference, and libraries can also keep manual authority files for nonroman script name headings as some institutions do (for a discussion of Hebrew authority control at Brandeis, see Katchen, 1993/94a). Without a national authority file, however, different libraries may—and do—pair differing Hebrew or Arabic script name headings with the same romanized name form.

Lerner (1993) describes the inconsistent handling of Hebrew and Yiddish names that results from this situation:

> At present, there are no U.S. standards for authority control for Hebrew and Yiddish names in Hebrew script. Stanford University enters a personal or corporate name in vernacular Hebrew script as it appears on the piece in hand. Brandeis University Hebraica librarians have always maintained authority file for Hebraica names which they also consult in deciding how names should be entered in vernacular Hebrew script online. The YIVO Institute for Jewish Research Library has maintained a multi-script authority file (Hebrew, roman and Cyrillic scripts) for Yiddish names since the early 1970's. The YIVO Institute Library, under the editorship of Zachary Baker and Bella Hass Weinberg, has recently published its catalog and authority file. This reference tool can assist catalogers who want to establish vernacular Hebrew script forms of Yiddish names, as well as to help catalogers "who seek the Library of Congress romanized counterpart of a Yiddish heading." (p. 120)

As for Arabic materials, the initial practice of the Library of Congress for the input of Arabic names was to input them exactly as they appeared on the item—i.e., in direct order. Kamel Muhammad Gab-Allah, senior cataloger of the Middle East and North Africa Team of LC's Regional and Cooperative Cataloging Division, explains that the LC practice later changed; presently, for names established according to systematic romanization, the corresponding name elements in Arabic are formulated to match the established form, regardless of what appears on the piece. As for names established in a westernized, nonsystematically romanized form, LC practice currently is not to provide a paired Arabic script name heading unless it is a subject heading, in which case the Arabic script name heading is supplied but is coded to indicate that the heading is an uncontrolled one (K. Gab-Allah, personal communication, 1996).

Since most of this cataloging activity—i.e., creating catalog records with paired roman/nonroman name headings—is taking place in RLIN, the same author may appear in the RLIN database under several different name forms in the nonroman script. If a librarian wishes to search the

RLIN database—whether for reference purposes or while searching for cataloging copy, it would be more fruitful to search by the romanized heading than by the nonroman script one. The romanized heading in principle retrieves all bibliographic items sharing a common author. To search via the nonroman script heading would require trying a variety of forms without being certain of having identified all of the possibilities; in addition, not all record clusters contain nonroman script name access points, which means that these titles would not be called up at all in a search using the nonroman script name heading. In addition, the variety of Hebrew or Arabic heading forms that may exist for a single name in the database means that during copy cataloging a library may have to replace the name heading input by another institution if it differs from the form that it uses, which represents additional cataloging effort. There is also a duplication of effort being done at individual libraries to maintain their own nonroman script authority files for cataloging purposes (see Appendix D for two Arabic bibliographic records with different forms of entry for Avicenna in the paired Arabic script author main entry field).

The need for nonroman script authority control is therefore quite clear. There are theoretically two approaches by which this might be accomplished. One approach would be to have an authorized nonroman name heading form (or forms, if the author wrote in more than one nonroman script), either provided within the authority record for the roman name heading or in a separate authority record. This would be the form to be input in a paired name heading field on the bibliographic record. Alternately, nonroman headings could be added to the authority record for the romanized name heading as cross-references only, relieving the library of the name to establish more than one authorized heading for a single person or corporate body as pointed out by Aliprand (1993b):

> All headings in bibliographic records should be under authority control, but most libraries will not have the resources to expend on additional control for headings in non-Roman scripts. If authority control for all headings is not an option, headings in bibliographic records should be limited to one script, and access in other scripts should be provided through cross-references. In the United States, Latin script is dominant, because the principal language for library access is in English. (Headings established under standard sources of authority such as *AACR2* and *LCSH* are either in English or are adaptations of foreign names and terms for English speakers). (pp. 32-33)

Aliprand (1993b) examines the *USMARC Format for Authority Data*'s provisions for the inclusion of nonroman script name headings in authority

records and discusses the implications for authority control of name access points of the different possible implementations of linkage of nonroman script fields. She concludes that it is preferable not to have more than one authorized form within a single record, that nonroman entries should serve either as cross-references within a record for a romanized name authority, or that a separate authority record should be provided if it is desired to have an authorized nonroman script name form. She also makes the point that functional equivalence provides the useful basis for providing nonroman script entries on an authority record, and that nonroman script entries should be able to stand alone rather than having to be paired with systematically romanized name headings.

Once nonroman script cross-references are available for a name heading in an authority record, it is not actually necessary to have a paired nonroman script name heading on the bibliographic record but rather only as a cross-reference on the authority record, as a nonroman script search would point to the romanized name heading and pull up the correct (romanized) name index. This approach would require, however, for nonroman-script name access to be effective, that every name heading in the database would have to have an authority record, or alternatively that, for any heading that did not have an authority record, a nonroman script paired name heading would be put on the bibliographic record. This is the approach that is taken with Hebrew and Arabic name headings at the ALEPH installation at the Ohio State University Libraries (OSUL), as explained by Joseph Galron, Jewish Studies librarian and Dona Straley, Middle East studies librarian, at OSUL. At OSUL, nonroman script name headings are added to in-process records. When authority records are created, the nonroman script name heading is removed from the bibliographic record and is added to the authority record as a cross reference. When items are cataloged on receipt, the nonroman script name heading is added directly to the authority record (J. Galron, personal communication, 1995; D. S. Straley, personal communication, 1996).

Whichever the approach, providing access to a bibliographic database via both romanized and nonroman script headings requires a significant commitment of cataloging time—whether names in the Hebrew or Arabic script are provided on every bibliographic record as a paired field or are added as cross-references on authority records which are created for every name heading that appears on a Hebrew or Arabic record. Another option for the use of Hebrew/Arabic script cross references in authority records is that they be used on an "as needed" basis to

provide clarification for problematic headings. This might well be useful for reference purposes for the cataloger, but it would not be a practical option for user access in a local online catalog because of the desirability of consistent modes of access that need to be provided to users.

Before nonroman script cross-references can effectively be incorporated in authority records on the national level, there are some practical issues to be resolved as explained by Eilts (1995):

> The USMARC format already has the provision for including nonroman script data in much the same manner as it is included in the bibliographic formats as alternate graphic representations. It has yet to be implemented. This is partly due to the integrated nature of authority record creation in North America. Authority records are created at the Library of Congress in its automated system (MUMS), and also by research libraries in the network of their choice—either OCLC or RLIN. These systems regularly send new and updated headings for inclusion in the other databases, and are never more than 24 hours out of synchronization. BUT, not all of the three systems have the same nonroman script capabilities and, in fact, MUMS does not currently allow the creation or display of any nonroman scripts.

Beyond the choice of the name heading, there is also an issue about the tagging of name headings. This is an evolving and complex issue, relating to whether Hebrew and Arabic script name headings may be paired with the 1XX, 6XX, or 7XX field in the case where the roman name heading was not established according to systematic romanization (e.g., "Maimonides, Moses," or "Avicenna"), or whether they must be placed in local fields (X9X). There is disagreement as to whether or not this is prescribed for Hebrew and Arabic name headings, and there have been differing practices in libraries (for background on this issue see Aliprand, 1986/87; 1989/90; 1993a; Katchen, 1993/94b; PCC, 1994. In particular, see Aliprand [1993a] for a compelling argument that semantic equivalence, not systematic romanization, should provide the basis for pairing name headings).

Regardless of the theoretical underpinnings, there is currently a practical cost to the use of local fields by some libraries for the input of nonroman script name headings where the roman heading was not established according to systematic romanization. This cost is due to the fact that local fields do not transfer in copy cataloging in RLIN.

> In copy cataloging, the x9x fields do not transfer in the DERive command. Because the Hebrew is not captured when another library's record is derived, the user of RLIN cataloging copy must rekey the Hebrew field(s). (Katchen, 1993/94a, p. 31)

Having to rekey data defeats the purpose of copy cataloging—i.e., which is to avoid having to do cataloging work which another library has already done. Katchen points out that the Library of Congress chose not to add Hebrew nonroman script headings in paired fields even where the roman heading is not done by systematic romanization, and that the Brandeis University Library has chosen to follow this practice as well for its Hebrew materials.

> At Brandeis, we have decided to no longer enter x9x fields in our Hebraic records. We, like many libraries, are looking for ways to increase our statistics and cut the costs of cataloging. By following the current practice of the Library of Congress and not the practice recommended by RLIN, all libraries will increase the accuracy, speed, and smoothness of operation for copy cataloging of Hebraica. (Katchen, 1993/94b, p. 32)

According to John Eilts (personal communication, 1995), library services officer at RLG, "a change request is being processed which will allow [the X9X fields] to carry over [with the DERive command] as users have requested this." Once it becomes possible to carry over the Hebrew/Arabic script data in the local fields, it should not make a difference in copy cataloging whether the nonroman script name entry is paired with a romanized field or is in a local field. With the RLIN Terminal for Windows, it should also be possible to cut and paste these data as an interim solution, which is still inconvenient but less so than rekeying data. If at some point all libraries drop the practice of using local fields for nonroman script name headings—as some have already done—then this will cease to be an issue altogether.

Subject Authority Control

Subject authority control represents far less of an issue for the automation of Hebrew and Arabic materials than does name authority control (other than for subject headings that are names). In a Western library environment, whether records are romanized-only or combination romanized/nonroman script, the same subject headings may be used for Hebrew and/or Arabic that are used for materials in any other language.

While a variety of subject headings or keyword schemes can be found in library databases throughout the Arabic-speaking Middle East, the Arabic terms in the Arab League's trilingual thesaurus, *JAMIA*, are used for keyword subjects at some institutions. At King Fahd University of Petroleum and Minerals, Nasser M. Swaydan's *Arabic Subject Heading*—prepared in 1978 for Riyadh University Libraries—was implemented for the Arabic database (Khurshid, 1992b), but a variety of other subject headings lists are in use at other libraries in the region. Ashoor (1989b) reports

on a plan in the university library cataloging community in Saudi Arabia in the early 1980s to create a standard set of subject headings based on the unification of Swaydan's Arabic subject headings list with Ibrahim A. El-Khazindar's *List of Arabic Subject Headings* prepared in 1983 for Kuwait University Libraries. In Israel, a variety of Hebrew subject heading schemes are in use; even among the university libraries on the ALEPH network, there is no standard set of subject headings. According to Elhanan Adler, assistant director of the University of Haifa Library, the most widely used set of Hebrew subject headings in Israel is that of the Thesaurus of the Index to Hebrew Periodicals project, upon which the Center for Libraries is basing its own subject headings list (E. Adler, personal communication, 1995). The Bar-Ilan University Library has adapted and translated into Hebrew a subset of the Library of Congress subject headings (LCSH) (Bar-Ilan, 1995), which it uses for its Hebrew materials; it uses LCSH for its materials in other languages (E. Adler, personal communication, 1995).

Some libraries using RLIN's nonroman script capabilities do input some or all of the subject fields (6XX) in the nonroman script as well. Some do this only for subjects that are proper names or uniform titles, although nonroman script entries may be entered for any subject field. Hebrew College enters all of its subject headings in the Hebrew script. According to Maurice Tuchman, director of Library Services in the Hebrew College Library, Hebrew College developed its own card authority file for Hebrew script subject headings, but the library is now looking to the Bar-Ilan translation of LCSH as a source of new headings and for the possible modification of existing ones (M. Tuchman, personal communication, 1995).

THE UNICODE STANDARD AND THE FUTURE OF MULTISCRIPT LIBRARY AUTOMATION

The implementation of the Unicode Standard looms on the horizon for library automation software. Unicode is a universal character set, including the characters of all major written languages, as well as other characters and symbols. With Unicode, software developers no longer have to deal with a varied array of character sets in order to internationalize their products; only one standard has to be implemented, regardless of the script in question (for background on character set standards and nonroman scripts through the late 1980s, see Clews, 1988).

The Unicode Standard is the product of a U. S.-based international consortium of computer manufacturers and other concerned parties—the Unicode Consortium, now Unicode, Inc. (Unicode is a trademark of

Unicode, Inc.). Unicode was originally developed in parallel to another super character set, ISO/IEC 10646 (also referred to as UCS—Universal Coded Character Set), which was the product of a joint technical committee (JTC1) of the International Electrotechnical Commission (IEC) and ISO. An agreement was eventually reached to merge the two standards. Aliprand (1994) explains:

> A significant event took place in 1991, when agreement was reached on incorporating the Unicode standard within the international standard's [ISO/IEC 10646] overall structure. As a result, the character repertoire and code point assignments of part 1 of ISO/IEC 10646 and of the Unicode standard, Version 1.1, are the same. (p. 87)

Unicode is a 16-bit standard, making it more compact than the full ISO/IEC 10646 32-bit standard, as described by Aliprand (1994):

> ISO/IEC stipulates a canonical encoding of four octets (abbreviated UCS-4) for characters, but also allows a reduced encoding in two octets (UCS-2). An octet is an ordered sequence of eight bits that is a unit....The canonical encoding of four octets requires values for the group octet, plane octet, row octet, and cell octet, respectively. Unicode (which encodes characters in 16 bits) is defined as a profile of UCS-2. (p. 87)

Character sets currently in use in commercial applications are more commonly encoded in 7 or 8 bits. An implementation of Unicode would result in greater data storage space requirements, as data encoded in 7- or 8-bit characters are replaced with data encoded in 16-bit characters, but would not, however, double the storage capacity needed as the data may be compressed significantly (Hullender, 19[illegible]). As data storage costs continue to decrease over time, this will not be a significant issue for most users.

Unicode, however, is not just a character set. It is an implementation of ISO/IEC 10646—presently the only one. For example, since the right-to-left orientation of Hebrew and Arabic is not imbedded in the Hebrew and Arabic characters themselves, the published Unicode standard includes a bi-directionality (BIDI) algorithm, as well as an algorithm for the contextualization of Arabic characters (Unicode, 1991-1992).

At such time as Unicode is implemented as a standard feature in library automation software, it will no longer be necessary for library automation developers to commit significant resources for the treatment of *specific* nonroman scripts.

One aspect of the data conversion is that for roman data in Unicode, diacritics (to be referred to as nonspacing marks or combining marks in the

context of Unicode) follow the letter with which they are associated. This is in contradistinction to the ALA extended character set currently implemented in USMARC, where diacritics precede the letter (Agenbroad, 1992). This change in diacritics sequencing would require adjustment for users of romanized data. This visual shift will not be noticeable, however, where software provides for the composition of diacritics and letters so that the diacritic appears correctly above or below the letter, as provided as an option by the current RLIN Terminal for Windows version 2 and McGill TCP3270 (for Windows), as pointed out by Michael Kaplan, head of Database Management and coordinator of OCLC/RLIN operations in the Harvard College Library (M. Kaplan, personal communication, 1995).

Agenbroad (1992) describes the various options relating to the implementation of Unicode in USMARC: no implementation; full implementation (replacement of the current USMARC character set with Unicode); partial implementation (continued use of the ALA extended character set for roman script data and use of the Unicode for nonroman script data, either by marking it with escape codes or by defining specific fields for use with Unicode); and parallel implementation (allowing the mapping of USMARC data to both the ALA and Unicode character sets, and allowing the USMARC record to be output as either of the two. Agenbroad examines the issues involved in each of these options.

The implementation of Unicode would only resolve technical issues of hardware and software vis-à-vis the Arabic and Hebrew (and other nonroman) scripts. While Unicode represents an important step forward in multiscript automation, it will not solve all of the problems of the automation of nonroman script bibliographic data. In particular, unless there is a change in the USMARC requirement of romanized data for core fields, catalogers will still have to key some fields more than once, as this is unrelated to the character set used. Unicode may, however, result in a greater number of library automation systems supporting nonroman scripts. This would increase the range of options available to libraries wishing to implement online catalogs where they could provide nonroman script data to patrons.

CONCLUSION

In automating a library, "Is it possible to...?" is no longer the question. A myriad of automation solutions are available to the library administrator. Even when a library has special needs—such as the support of nonroman scripts—solutions are available or, if they are not available, they can be developed. Since no institution has unlimited resources, however, automation means prioritization of needs. Proposed solutions need to be weighed

against several factors, factors that relate not only to the automation of Hebrew and Arabic data but to all automation decisions:

- Cost: what are the costs of setting up and maintaining the hardware/software configuration—both direct monetary costs and staff time (also a monetary cost)? What are the cataloging costs (original and copy) as well as that of other technical services functions? What is the current and future budget available for automation-related expenses, and how do the costs of a particular automation option (hardware, software, cataloging policy) compare to the cost of other automation options? Cost implicitly or explicitly underlies the evaluation of the other factors listed below.
- Technical feasibility: does the desired functionality already exist in some hardware/software configuration or will it have to be developed?
- Productivity/Efficiency: what effect will the automation solution have on the volume of library materials that can be processed by staff?
- Access: to what extent will the targeted user communities be able to use the database effectively to retrieve the desired materials?
- Forward compatibility and data-sharing capacity: will the hardware/software configuration be easily expandable/upgradeable/convertible to fulfill possible future needs, and will it be possible to exchange data easily with other institutions locally and internationally?
- Satisfaction (the least tangible element): will the automation solution satisfy both the actual and perceived needs of the user community (both library staff and patrons), and will it fit the institutional culture?

These are factors that need to be weighed differently by different libraries. Public libraries, for example, may be more likely than university libraries to have cost as an overriding factor, and also to have ease of access as a particularly important consideration. For university research libraries, productivity is very important in order to provide as much material as possible as quickly as possible to a wide audience of patrons in a cost-effective manner. Smaller research libraries with specialized audiences may decide that certain special features fulfilling the needs of a specific user community are to be given priority.

Given these factors, it is informative to look at the automation choices made by libraries with nonroman data around the world. The major library installations providing local access to Hebrew or Arabic in their original scripts without parallel romanization are in the Middle East. For these institutions, the provision of data in the Hebrew or Arabic script was understandably an absolute requirement, with considerations

of patron and staff access and overall satisfaction figuring highly. For this reason, King Fahd University of Petroleum and Minerals was willing to incur significant development costs in arabizing DOBIS/LIBIS as were other institutions that self-developed arabized library applications. Simlarly, the Israeli library community was willing to sacrifice ease in international data sharing in the short- and medium-term when accepting the ALEPH format (although local data sharing was significantly enhanced by the uniform acceptance of ALEPH).

Outside of the Middle East, there are a only a few institutions providing access to Hebrew or Arabic collections in the Hebrew or Arabic script without parallel romanized data, such as the library of the Institut du Monde Arabe, the Jewish Public Library of Montreal, two CSIC ALEPH installations in Spain, Odense University's Center for Contemporary Middle East Studies, and the automated British Library Catalogue discussed above. The first five represent smaller specialized libraries, where these languages play an important, even central, role. The Arabic-script database at Odense, however, is in parallel to the main catalog, which includes romanized data only. The first two libraries—the IMA and JPL--are not just research libraries but are also public libraries, where specialized knowledge, such as that of romanization rules, cannot always be expected of patrons. Indeed, the JPL specifically chose to implement nonroman script-only cataloging so that it would not have to input romanized data in addition to the Hebrew script data. As for the Hebrew script access at the British Library, this represents a very small subset of Hebrew bibliographic data at that institution and was implemented only in the course of retrospective conversion of the main catalog, not for retrospective conversion of the Hebrew catalog nor current Hebrew cataloging which is still done on cards.

Most automated research libraries outside of the Middle East, however, have online catalogs that provide access only in romanized form. Romanization allows these libraries to provide access to Hebrew and Arabic bibliographic data within the framework of their general library automation infrastructure. A survey of libraries in the United States doing Hebrew or Arabic cataloging found only a handful of libraries where Hebrew or Arabic script support was currently available in the online catalog for both display and searching (Jewish Theological Seminary of America, University of Pennsylvania's Center for Judaic Studies, Ohio State University's Jewish and Middle East Studies Libraries) or was in the process of being implemented for display only (Brandeis University) or for searching and display (Yeshiva University). In the case of the

University of Pennsylvania and Ohio State University, the ALEPH catalogs are provided in parallel to the main university online catalogs which do not, at present, support the Hebrew or Arabic scripts. It would appear that the constraints associated with providing local online catalog access in nonroman scripts have limited the adoption of online catalogs with Hebrew or Arabic script capability in American university and research libraries.

From the high percentage of libraries of institutions of higher Jewish learning (where Hebrew collections and the Hebrew script are central to the educational mission of the institution) among the libraries doing combination romanized/Hebrew script cataloging, one might infer that the impetus to provide local access to Hebrew bibliographic data in the Hebrew script in these institutions may be attributed at least in part to their institutional cultures, where a priority has understandably been placed in providing, either currently or prospectively, local access in the Hebrew script. A few other university and research libraries in the United States do combination romanized/nonroman script cataloging in RLIN for some or all of their Hebrew and Arabic materials but provide only the romanized data in their online catalogs such as the Harvard Law School Library (Arabic), Library of Congress (Hebrew and Arabic), New York Public Library (Hebrew and Arabic), New York University (Hebrew and Arabic), Stanford University (Hebrew), University of Michigan (Hebrew and Arabic), University of Pennsylvania (Arabic), and Yale University (Hebrew and Arabic). It would appear that these institutions have concluded that the projected future benefits of the nonroman data being added to their records outweigh the present additional cataloging costs; some of these hope to provide direct patron access to Hebrew or Arabic script in RLIN in the near future, and to have an online catalog that supports these scripts in the more distant future.

Many other libraries, both in the United States and abroad, have chosen romanized-only cataloging as best serving their needs at this time. In addition, although a large amount of combination romanized/nonroman script cataloging has been done in the past decade for Hebrew and Arabic, the vast majority of patron search transactions in online catalogs in Western library settings continue to be carried out in the roman script because of the very small number of libraries with online catalogs that support the Hebrew and Arabic scripts for searching. Scholars in the disciplines using Hebrew- and Arabic-script materials have continued to use Hebrew and Arabic library collections since their automation by romanization, and have benefitted from the advantages of

automation previously not available to them with the Hebrew and Arabic card catalogs (keyword and Boolean searching, remote access, etc.). While romanization may not be considered the preferred form of access to Hebrew and Arabic bibliographic data by many librarians and patrons, it appears that romanized only cataloging has provided a practical strategy for libraries in a Western research library setting to process their materials and to provide patron access to them, consistent with the economic realities in higher education today.

While more libraries in the future may have online catalogs that provide nonroman script support, the productivity issue will still have to be addressed by libraries. Libraries contemplating adopting combination romanized/nonroman script cataloging will have to evaluate whether or when they will be able to implement an online catalog supporting these scripts, as well as what the projected impact of the implementation of an online catalog supporting these scripts will have on productivity and patron access. At the same time, each library has specific local needs, and any automation solution must fit those needs.

The choices made by libraries for their online cataloging of Hebrew and Arabic materials illustrate how libraries undergoing automation need to weigh the options available to them. While Hebrew and Arabic materials concern a relatively small segment of the research library community, the issues raised are relevant to the research library community at large.

79

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APPENDIX A

Title Counts of Hebrew and Arabic Script Language Materials in OCLC and RLIN

	OCLC (titles—all formats)	RLIN (titles—books & serials)	RLIN (title clusters containing Arabic/Hebrew script)
Hebrew	166,757	218,663	91,774
Yiddish	30,650	32,523	9,258
Arabic	172,673	197,760	23,396
Persian	37,314	38,928	2,416
Urdu	25,397	30,168	26

(OCLC statistics as of 1 January 1996; OCLC statistics provided by Richard Greene, senior consulting database specialist, OCLC Online Computer Library Center, Inc.)
(RLIN statistics as of September 1995; RLIN statistics provided by John Eilts, Library and Bibliographic Services, The Research Libraries Group, Inc.)

APPENDIX B (PART 1)

Hebrew Record in RLIN with ANSI Reversible Romanization

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BKS/PROD  Books        FUL/BIB   NYPX87-B6070          Catalog          MHAG-HYS
FIN TP MISHNEH TORAH= ALSO LI NYPX - Cluster 38 of 39
HOL
  ID:NYPX87-B6070              RTYP:c    ST:p    FRN:    MS:   EL:?    AD:11-04-87
  CC:9114  BLT:am      DCF:a    CSC:     MOD:r   SNR:       ATC:       UD:05-19-89
  CP:ie       L:heb    INT:     GPC:     BIO:    FIC:0      CON:
  PC:a       PD:1983/           REP:     CPI:0   FSI:0      ILC:       II:0
  MMD:        OR:     POL:      DM:      RR:     COL:       EML:       GEN:    BSE:
  010      84122262
  040      ‡cNN‡dNN
  050 0    BJ1287.M63‡bM57
  100 10   Maimonides, Moses,‡d1135-1204
  240 10   Mishneh Torah.‡kSelections
  245 14   (H)SPR MWSRY HRMB"/M :‡bHWRAH LDR/K H.HYY/M WTWK HT MWSR /‡cA'SR LWQ.T
           MSPR "YD H.HZQH". LRBYMW M'SH BR MYMW/N &L-YDY 'SM&W/N SWPR.(R)
  250      (H)HWCAH 7.(R)
  260 0    (H)YRW'SLY/M :‡bQD/M.(R)‡c743 (1983).
  300      175 p. ;‡c23 cm.
  500      Cover title:(H)MWSRY HRMB"/M.(R)
  650  0   Ethics, Jewish.
  700 10   Sofer, Simeon,‡d1850-1944.
  799 01   Sefer Musre ha-Rambam.
  799 01   Musre ha-Rambam.
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APPENDIX B (PART 2)

Hebrew Record in RLIN for Identical Bibliographic Item with ALA/LC Romanization

```
BKS/PROD  Books        FUL/BIB   DCLC84122262-B          Catalog          MHAG-HYS
FIN TP SEFER MUSRE HA-RAMB - Cluster 4 of 5
•b
  ID:DCLC84122262-B          RTYP:c    ST:p    FRN:    MS:n  EL:      AD:82-22-84
  CC:9110  BLT:aa      DCF:a    CSC:     MOD:r   SNR:      ATC:       UD:81-01-01
  CP:is       L:heb     INT:     GPC:     BIO:    FIC:0     CON:
  PC:a       PD:1983/            REP:     CPI:0   FSI:0     ILC:       II:0
  MMD:       OR:     POL:      DM:      RR:        COL:      EML:     GEN:    BSE:
  010      84122262/HE
  040      ▪dCStRLIN
  050 0    BJ1287.M63▪bM57 1983
  100 10   Maimonides, Moses,▪d1135-1204.
  240 10   Mishneh Torah.▪kSelections
  245 10   Sefer Musre ha-Rambam :▪bhora'ah le-derekh ha-ḥayim ṿe-tokha ḥat mus
           ar /▪casher lu ka t mi-sefer "Yad ha-ḥaz kah" le-Rabenu Mosheh ben Maim
           on 'al-yede Shim'on Sofer.
  250      Hotsa'ah 7.
  260 0    Yerushalayim :▪bMekhon,▪c743 [1983]
  300      175 p. ;▪c23 cm.
  500      Cover title: Musre ha-Rambam.
  650  0   Ethics, Jewish.
  700 10   Sofer, Simeon,▪d1858-1944.
  740 01   Musre ha-Rambam.
```

APPENDIX C

Hebrew Record in RLIN with ALA/LC Romanization and Paired Hebrew Script Name Heading

```
BKS/PROD  Books        FUL/BIB   DCLH95-B2678            Catalog          MHAG-HYS
FIN TV SHELIHUT - Cluster 11 of 133 - HBR
*
  ID:DCLH95-B2678              RTYP:c     ST:p    FRN:    MS:    EL:      AD:09-05-95
  CC:9552  BLT:mm       DCF:a     CSC:d    MOD:    SNR:       ATC:       UD:11-27-95
  CP:is       L:heb      INT:     GPC:     BIO:d   FIC:0      CON:
  PC:a        PD:1995/             REP:     CPI:0   FSI:0      ILC:        II:0
  MMD:        OR:     POL:      DN:      RR:        COL:       EML:       GEN:    BSE:
  010      95838411/HE
  020      965131!0388
  040      MH#cMH#dCStRLIN#dNN#dMWa!B#dDLC-R
  042      lccopycat
  043      a-is---
  050 0    DS126.7#b.B36 1995 <Hebr>
  100 2    Ben Aharon, Yitzhak,#d1906-
  100 2                                                          בן-אהרן, יצחק,#d1906-
  245 10   Ma'al ha-dukhan :#b'e'orim ve-arba' shenot sheli;hut bi-Kheneset Yi
        sra'el /#cYits;ha;k Ben-Aharon ; ba-'arikhat Tsevi;kah Deror.
  245 10   מעל הדוכן :#bשערים וארבע שנות שליחות בכנסת ישראל /#cיצחק בן-אהרן ; בער
                                                                 יכת צביקה דרור.
  246 1    #iTitle on verso of t.p.:#aParliamentary struggles
  260      Tel Aviv :#b'Am 'oved :#aBeersheba! :#bUniversi;tat Ben-Gurion ba-Neg
        ev,#c1995.
  260      .1995c#.אבנ"ג בן-גוריון בנגב :#aבאר שבע ;#bעם עובד ,#aתל אביב
BKS/PROD  Books        FUL/BIB   DCLH95-B2678            Catalog          MHAG-HYS
Cluster 11 of 133 - HBR
HOL
  300      317 p. ;#c23 cm.
  600 20   Ben Aharon, Yitzhak,#d1906-
  600 24                                                         בן-אהרן, יצחק,#d1906-
  610 10   Israel.#bKeneset.
  610 14                                                                 ישראל.#bכנסת.
  650  0   Speeches, addresses, etc., Israeli.
  651  0   Israel#xPolitics and government.
  651  4                                                                  ישראל.
  650  0   Labor Zionism#zIsrael.
  700 1    Dror, Zvika.
  700 1                                                                  דרור, צביקה.
  LDC      unbound
  LDE      ap
  LDF      #12
```

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APPENDIX D (PART 1)

Arabic Records in RLIN with ALA/LC Romanization and Paired Arabic Script Name Heading*

```
BKS/PROD  Books        FUL/BIB   DCLN94-B118              Catalog            MHAG-HYS
FIN ID DCLN94-B118 - Record 1 of 1 - ARB
HOL
  ID:DCLN94-B118              RTYP:c     ST:p    FRN:    MS:    EL:      AD:01-28-94
  CC:9554  BLT:an       DCF:a    CSC:     MOD:     SNR:       ATC:       UD:06-15-94
  CP:us       L:ara       INT:     GPC:     BIO:     FIC:0      CON:
  PC:a        PD:1947/9999        REP:     CPI:0    FSI:0      ILC:a      II:0
  MMD:        OR:     POL:      DM:      RR:        COL:       EML:       GEN:    BSE:
  010      74219864/NE/r94
  040      DLC#cDLC#dDLC-R
  050 00   B751#b.I6 1947 <Orien Arab>
  100 0    Aviconna,#d980?-1037.
  100 0                                                                    ابن سينا
  245 13   al-Ish"ar"at wa-al-tanb"ih"at /#c|i|-Ra'"is Ibn S"in"a ; .ea.h.ha.hahu
           wa-"allaqa 'alayhi wa-qaddama la-hu Sulaya"an Duny"a.
  245 12      الاشارات والتنبيهات /#cلرئيس ابن سينا ؛ صححه وعلق عليه وقدم له سليمان
  260      [Cairo] :#bD"ar I.hy"a' al-Kutub al-"Arab"iyah,#c1947-<1948   >
  260                          :|947-<1948    >#c:دار احياء الكتب العربية،#b: [Cairo]
  300      v. <1-2   > :#bill. ;#c20 cm.
  505 1    qism 1. al-Man.tiq -- qism 2. al-Tab"i'ah.
  650  0   Philosophy, Islamic#xEarly works to 1800.
  700 10   Duny"a, Sulaya"an.
  700 10                                                                   دنيا، سليمان.
  LDB      Recat. to AACR2--yh9! 01-28-94.
```

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*These records contain variant forms for the author main entry as they appear in the Arabic script, although they have identical forms in romanization.

APPENDIX D (PART 2)

Arabic Records in RLIN with ALA/LC Romanization and Paired Arabic Script Name Heading*

```
BKS/PROD  Books        FUL/BIB    NYUG94-B5027            Catalog          MHAG-HYS
FIN PN AVICENNA ALSO LG ARA - Cluster 85 of 432 - ARB
*
  ID:NYUG94-B5027              RTYP:c     ST:p     FRN:     MS:     EL:      AD:02-02-94
  CC:9125  BLT:am       DCF:a     CSC:     MOD:     SNR:       ATC:          UD:03-23-94
  CP:ir       L:ara     INT:      GPC:o    BIO:     FIC:0      CON:
  PC:r       PD:1973/1910         REP:     CPI:0    FSI:0      ILC:          II:0
  MMD:        OR:      POL:      DM:       RR:      COL:       EML:       GEN:     BSE:
  010      73960850
  040      ǂcNNǂdNNU
  050 0    B751ǂb.M4 1973
  100 0    Avicenna,ǂd980-1037.
  100 0                                                                  ابو علي بن سينا.
  245 13   al-Qaṣ̄idah al-muzdawijah f̄ī al-man.tiq wa-man.tiq al-mashriq̄iȳin
          /ǂcta,an̄ if Ab̄ī ʻAl̄ī ibn S̄in̄a.
  245 12                                                  القصيدة المزدوجة في المنطق ومنطق المشرقيين /ǂcهران :ǂbضميمه أبي علي بن
                                                                                                                  سينا.
  260      ,Tihr̄an :ǂbMaktabat al-Jaʻfar̄ī al-Tabr̄iz̄ī,ǂc[1973]
  260                                                  [1973]c٩:ǂbكتبة الجعفري التبريزي:ǂbطهران
  300      39, 18, 83, 3 p. ;ǂc24 cm.
  500      In Arabic.
  500      Cover title.
  534      ǂpReprint of the 1910 ? ed.
  650  0   Logic ǂxEarly works to 1800.
BKS/PROD  Books        FUL/BIB    NYUG94-B5027            Catalog          MHAG-HYS
Cluster 85 of 432 - ARB
HDL
  700 02   Avicenna,ǂd980-1037.ǂtMan.tiq al-Mashriq̄iȳin.
  700 00                                                                 ابو علي بن سينا.
```

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*These records contain variant forms for the author main entry as they appear in the Arabic script, although they have identical forms in romanization.

REFERENCES

AACR2. (1978). *Anglo-American cataloguing rules*, 2d ed. Chicago, IL: American Library Association.

Academy of the Hebrew Language. (1958/59). Kelale ha-ta'atik me-ketav 'Ivri le-ketav Latini. *Zikhronot ha-Akademyah la-Lashon ha-'Ivrit, 3/4*(1955/56-1956/57), 5-8.

Adler, E. (1979). An on-line thesaurus for information retrieval. In *Proceedings of The International Conference on Literary and Linguistic Computing* (pp. 191-195). Tel-Aviv: Katz Research Institute for Hebrew Literature, Tel-Aviv University.

Adler, E. (1982). Hebrew cataloging and the computer—The view from Israel. *Information Technology and Libraries*, (September), 238-245.

Adler, E. (1985). The library automation scene in Israel—1985. *Judaica Librarianship, 2*(1/2), 7-8.

Adler, E. (1986/87). The library automation scene in Israel—1986. *Judaica Librarianship, 3* (1/2), 21-23.

Adler, E. (1987/88). The use of Israeli machine-readable cataloging by American libraries: A proposal. *Judaica Librarianship, 4*(1), 23-26.

Adler, E. (1989). The state of the art in Hebraica library automation: American and Israeli standards and practices. In *Hebrew Studies* (Papers presented at a colloquium on resources for Hebraica in Europe held at the School of Oriental and African Studies, University of London, 11-13 September 1989). London, England: The British Library.

Adler, E. (1994). *The Israeli university libraries and the conversion to ALEPH 3.2.5*. Preprint of paper read to annual ICAU (International Consortium of ALEPH Users) Conference—Madrid, 17-18 October.

Adler, E. (1995). *The Israeli university libraries and ALEPH: Conversion to version 3.2.5*. Preprint of paper read to annual ICAU (International Consortium of ALEPH Users) Conference—Prague, 18-19 September.

Adler, E.; Shichor, A.; & Kedar, R. (1995). *ha-Kitlug: sefer yesodot u-kelalim*, 3d ed. Jerusalem: Center for Libraries.

Agenbroad, J. E. (1992). *Nonromanization: Prospects for improving automated cataloging of items in other writing systems*. Washington, DC: Cataloging Forum, Library of Congress.

Aissing, A. L. (1995). Cyrillic transliteration and its users. *College & Research Libraries*, (May), 207-219.

Al-Anzi, K., & Collier, M. (1994). Arabisation of library and information systems. *Program, 28*(4), 395-403.

Al-Muhtaseb, Husni; Ashoor, M. S.; & Khurshid, Z. (1994). *A step towards Arabic machine-readable cataloging (ARABMARC)*. Unpublished paper, Special Libraries Association, Arabian Gulf Chapter, Conference on Exploiting Technology for Effective Information Management in the Arabian Gulf Region, January 12-14.

Al-Shorbaji, N., & El-Bacheat, B. (1992). Bibliographic formats used in libraries and documentation centres in Jordan: A survey. [In Arabic] *Risalat al-maktabah, 27*(4), 4–29.

Aliprand, J. M. (1986/87). Hebrew on RLIN. *Judaica Librarianship, 3*(1/2), 5–16.

Aliprand, J. M. (1989/90). Hebrew on RLIN—An update. *Judaica Librarianship, 5*(1), 12-20.

Aliprand, J. M. (1992a). Arabic script on RLIN. *Library Hi-Tech, 10*(4), 59-80.

Aliprand, J. M. (1992b). Nonroman scripts in the bibliographic environment. *Information Technology and Libraries*, (June), 105–119.

Aliprand, J. M. (1993). Linkage in USMARC bibliographic records. *Cataloging & Classification Quarterly, 16*(1), 5-37.

Aliprand, J. M. (1993a). Linking of alternate graphic representation in USMARC authority records. *Cataloging & Classification Quarterly, 18*(1), 27-62.

Aliprand, J. M. (1994). Unicode™ and ISO/IEC 10646: An overview. In *Automated systems for access to multilingual and multiscript library materials*. Munich: K. G. Saur.

Aman, M. (1987). Use of Arabic script in computerized information systems. In *Automated systems for access to multilingual library materials —Problems and solutions*. Munich: K. G. Saur.

ANSI. (1975). *American National Standard romanization of Hebrew*. New York: American National Standards Institute. (ANSI Z39.25-1975)

Apedaile, R. (1994). Romanization in public libraries. *LASIE, 24*(6), 105-108.
Ashoor, M. S. (1989a). Arabization of automated library systems in the Arab world: Need for compatibility and standardization. *Libri, 39*(4), 294-302.
Ashoor, M. S. (1989b). Bibliographic networking in the Arabian Gulf Region: Prospects and problems. *Resource Sharing and Information Networks, 4*(2), 13-24.
Ashoor, M. S. (1989c). A short account of the development of DOBIS/LIBIS Regional Center at KFUPM. *Focus on International and Comparative Librarianship, 20*(2), 30-33.
Ashoor, M. S., & Chaudhry, A. S. (1994). Bi-lingual bibliographic software for processing library materials in the Arabic language. *Program, 28*(2), 167–175.
Avram, H. (1985). UNIMARC version of MINISIS. *IFLA Journal, 11*(2), 120–123.
Ballance, V. (1991). *Opening "Windows" on MINISIS: A new solution to the old problem of automating non-roman scripts.* Unpublished paper presented to the 12th MINISIS User's Group, Port of Spain, Trinidad, April 29-May 3.
Ballance, V. (1993a). Cataloging in the official and heritage languages at the National Library of Canada. *Cataloging & Classification Quarterly, 17*(1/2), 219-232.
Ballance, V. (1993b). Using the Windows GUI to create a multilingual, multiscript database on MINISIS. *Library Software Review, 12*(3), 24-29.
Bar-Ilan University. (1995). *Kotrot nos'im be-'Ivrit =Hebrew subject headings.* [Cumulation 1983-1995]. Ramat Gan: Wurzweiler Central Library, Bar-Ilan University.
Barry, R. K. (1991). The standards dilemma of character sets. *Information Standards Quarterly, 3*(2), 8.
Beit-Arié, M. (1991). The codicological data-base of the Hebrew Paleography Project: A tool for localising and dating Hebrew medieval manuscripts. In *Hebrew studies* (Papers presented at a colloquium on resources for Hebraica in Europe held at the School of Oriental and African Studies, University of London, 11-13 September 1989). London, England: The British Library.
Brandhorst, T. (1979). ANSI Z39 romanization standards and "reversibility": A dialog to arrive at a policy. *Journal of the American Society for Information Science, 30*(1), 54-59.
Brickell, A., & Kirk, C. (1991). Background to the British Library Catalogue conversion. In *Hebrew Studies* (Papers presented at a colloquium on resources for Hebraica in Europe held at the School of Oriental and African Studies, University of London, 11-13 September 1989). London, England: The British Library.
British Library—Hebrew. (1992). *Hebrew-character entries from The British Library general catalogue.* London, England: The British Library.
British Library—Yiddish. (1992). *Yiddish printed books from The British Library general catalogue.* London, England: The British Library.
Brophy, P.; Peters, J.; Storey, C.; & Jordin, A. (1990). *DOBIS/LIBIS: A guide for librarians and systems managers.* Aldershot: Gower.
Butcher, R. (1993). Multi-lingual OPAC developments in the British Library. *Program, 27*(2), 165–171.
Butcher, R. (1995). The application of IT in the St Pancras Building of the British Library. *Alexandria, 7*(2), 83-96.
Buxton, A., & Hopkinson, A. (1994). *The CDS/ISIS handbook.* London, England: The Library Association.
Chachra, V. (1994a). *Arabic implementation in VTLS.* Unpublished paper.
Chachra, V. (1994b). *Hebrew implementation in VTLS.* Unpublished paper.
Chaudhry, A. S., & Ashoor, M. S. (1990). Potential of DOBIS/LIBIS and MINISIS for automating library functions: A comparative study. *Program, 24*(2), 109–128.
Clews, J. (1988). *Language automation worldwide: The development of character set standards.* Harrogate, England: SESAME.
Descamps-Wassif, S. (1995). La banque de données A'LAM de l'Institut du Monde Arabe. *Documentaliste, 32*(1), 39-42.
Dienstag, C. (1993/94). Modifications made by the New York Public Library to RLIN Hebraica records. *Judaica Librarianship, 8*(1/2), 27-30.
DIN-Arabic. (1982). *DIN 31635: Umschrift des arabischen Alphabets.* Berlin: Beuth Verlag.
DIN-Hebrew. (1982). *DIN 31636: Umschrift des hebräischen Alphabets.* Berlin: Beuth Verlag.

Eilts, J. (1995). *Non-Roman Script Materials in North American libraries: Automation and international exchange.* Preprint of paper to be presented to 61st IFLA General Conference, August 20-25.

Feijen, M. (1991). PICA library systems: The third generation. *Program, 25*(2), 105-117.

Filstrup, C. (1981). The computer as romanizer. *Occasional Papers in Middle Eastern Librarianship, 1.*

Gavin, T. A. G. (1994). Recent developments in the MINISIS computer software for developing countries. In *Automated systems for access to multilingual and multiscript library materials.* Munich: K. G. Saur.

Ghaebi, A. (1995). The evaluation of library softwares: General and quality criteria [in Persian]. *Fasl name-ye ketab, 6*(2), 40-65.

Handy, N. (1980). Cataloging and classifying Arabic materials. In *Cataloging and classification of non-Western material: Concerns, issues and practices.* Phoenix, AZ: Oryx.

Hirsch, D. (1995). United Arab Emirates University Libraries, Al-Ain, United Arab Emirates: September-December, 1993 and February-May 1994. *MELA Notes, 62,* 5-14.

Hopkinson, A. (1995a). CDS/ISIS information: The first ten years of the microcomputer version. *Information Development, 11*(1), 10-14.

Hopkinson, A. (1995b). CDS/ISIS information: The Netherlands/Pakistan Library Automation and Management Program (LAMP). *Information Development, 11*(2), 91.

Houissa, A. (1991). Arabic personal names: Their components and rendering in catalogue entries. *Cataloging & Classification Quarterly, 13*(2), 3-22.

Houissa, S. (1994). Infrastructure and libraries in Tunisia. In *Information and libraries in the Arab world.* London, England: Library Association.

Hullender, G. (1992). *Compression of Unicode data.* Unpublished paper presented at the Unicode Implementers Workshop #2, Merrimack, New Hampshire, 12-13 March.

IDSC Library. (1995). al-Nizam al-ah LIS2. [In Arabic]. *Akhbar al Maktabah, 1*(3), 2.

Itavem, M. A. (1994). National libraries in the Arab world. In *Information and libraries in the Arab world.* London, England: Library Association.

Jajko, E. A. (1993). Cataloging of Middle Eastern materials: Arabic, Persian, and Turkish. *Cataloging & Classification Quarterly, 17*(1/2), 133-147.

Jaudenes Casaubon, M., & Santo Domingo, N. T. (1994). A Mediterranean perspective: Spain's Biblioteca Nacional. In *Automated systems for access to multilingual and multiscript library materials.* Munich: K. G. Saur.

Katchen, R. (1987/88). Retrospective conversion of Hebraica at Brandeis University. *Judaica Librarianship, 4*(1), 20-22.

Katchen, R. (1989/90). Hebrew online: Current issues and future concerns: A view from the field. *Judaica Librarianship, 5*(1), 22-25.

Katchen, R. (1993/94a). Hebraica authority control at Brandeis. *Judaica Librarianship, 8*(1/2), 56-60.

Katchen, R. (1993/94b). Use or non-use of parallel linking fields in RLIN for Hebrew-script access points. *Judaica Librarianship, 8*(1/2), 31-32.

Khalid, F. A. (1983). Automation in a special library in Kuwait. *Information Technologies and Libraries,* (December), 351-363.

Khurshid, Z. (1992a). Arabic online catalogue. *Information Technology and Libraries,* (September), 244-251.

Khurshid, Z. (1992b). A decade of DOBIS/LIBIS at the King Fahd University of Petroleum and Minerals Library in Saudi Arabia. *Program, 26*(2), 111-123.

Khurshid, Z. (1994). Maintenance of the Dobis/Libis database. *Aslib Proceedings, 46*(2), 43-47.

Kirkwood, F. T. (1992). Automation of multilingual library services. In *Multicultural librarianship: An international handbook.* Munich: K.G. Saur.

Lazinger, S. S. (1991). ALEPH: Israel's research library network: Background, evolution, and implications for networking in a small country. *Information Technology and Libraries, 10*(4), 275-291.

Lerner, H. G. (1993). A look at Hebraica cataloging in the United States: Access versus cost. *Cataloging & Classification Quarterly, 17*(1/2), 115-131.

91 BEST COPY AVAILABLE

Lerner, H. G. (1993/94). Modification of RLIN Hebraica records: A cataloging workshop: Current practices and standards of cataloging Hebraica in RLIN. *Judaica Librarianship, 8*(1-2), 25-26.

Levi, J. (1984). ALEPH: An online real-time integrated library system. *Judaica Librarianship, 1*(2), 58-63.

LCRI. (1984). Library of Congress Rule Interpretations (LCRI)—1.0E. Language and script of the description. [Rev.] November 1984. *Cataloging Service Bulletin, 27*(Winter), 9-17.

Library of Congress, Processing Services. (1991). *LC romanization tables and cataloging policies.* Metuchen, NJ: Scarecrow.

MacDougall, S. (1991). *The state of the art in the handling of vernacular scripts in library systems.* Unpublished report prepared for the Australian Bibliographic Network Office, Canberra.

Maccaferri, J. T. (1985). Ottoman Turkish cataloging I: Romanization. *Cataloging & Classification Quarterly,* 5(4), 17-38.

Madkour, M. A. K. (1980). Information processing and retrieval in Arab countries: Traditional approaches and modern potentials. *Unesco Journal of Information Science, Librarianship and Archives Administration, 2,* 97-104.

Maher, P. (1987). *Hebraica cataloging: A guide to ALA/LC romanization and descriptive cataloging.* Washington, DC: Cataloging Distribution Service, Library of Congress.

Malinconico, S. M.; Grutchfield, W. R.; & Steiner, E. J. (1977). Vernacular scripts in the NYPL automated bibliographic control system. *Journal of Library Automation, 10*(3), 205-225.

Merkis, W. (1988). Multilingual DBMS access. *Interact,* (October), 97-100.

MINISIS II.S. (1994). *MINISIS Integrated Library System overview.* Ottawa: IDRC.

NCOLR. (1995). *Report on a survey on computerised activities.* [UK]: National Council on Orientalist Library Resources.

Odds, P. (1990). Problems of retrospective conversion in national and research libraries: The conversion of the British Library Catalogue to machine-readable form. *IFLA Journal, 16*(1), 85-86.

Panzer, C. (1992). ALEPH: A multiscriptual, multilingual library management system. Section 13.2 of *Proceedings of the 3rd International Conference and Exhibition on Multi-lingual Computing, Durham 10-12 December 1992.* Durham, England: University of Durham, Centre for Middle Eastern and Islamic Studies.

PCC. (1994). *Nonroman core record task group final report* (Program for Cooperative Cataloging). (For the text of this report, see: "Core Record for JACKPHY Materials" on the Program for Cooperative Cataloging Home Page: gopher://marvel.loc.gov/00/services/cataloging/coop/coop.cnrl)

Peccatte, R. (1987). Le système MINISIS à l'Institut du Monde Arabe. *Documentaliste, 24*(3), 119-122.

PI. (1909). *Instruktionen für die alphabetischen Kataloge der preussischen Bibliotheken vom 10 Mai 1889,* 2d rev. ed. Berlin: Behrend & Co. (romanization tables in Appendix 2).

Pobukovsky, M. (1980). Unesco's integrated documentation network: The CDS/ISIS system. *Unesco Journal of Information Science, Librarianship and Archives Administration, 2*(3), 195-203.

Pobukovsky, M. (1985). The Unesco computerized documentation system. *Information Development, 1*(1), 15-18.

Rad-El, B. (1994). Approaches to multilanguage and multiscript issues in the ALEPH system. In *Automated systems for access to multilingual and multiscript library materials.* Munich: K. G. Saur.

RITSEC. (1993). Data base: Headquartered in Cairo, RITSEC leads the Middle East's efforts to compete in the worldwide software race. *Cairo Today,* April, pp. 99-102, 131.

Research Libraries Group. (1991). *Non-Roman supplement to Cataloging in RLIN, II,* 3d ed. Stanford, CT: RLG.

Research Libraries Group. (1995). *FY96 rates for user services from RLG.* Mountain View, CA: RLG.

Rodinson, M. (1964). Les principes de la translittération, la translittération de l'arabe et la nouvelle norme de l'ISO. *Bulletin des Bibliothèques de France, 9*(1), 1-24.

Roitberg, N. (1990). The computerized network of Israeli university libraries. *Iatul Quarterly, 4*(1), 2-8.

Rush, J. (1994). A case for eliminating cataloging in the individual library. In *The future is now: The changing face of technical services* (Proceedings of the OCLC Symposium, ALA Midwinter Conference, February 4, 1994). Dublin, Ohio: OCLC.

Saffady, W. (1994a). Elias N.V. *Library Technology Reports,* (March-April), 201-213.

Saffady, W. (1994b). Ex Libris Ltd. *Library Technology Reports,* (March-April), 215-224.

Schrijver, E. G. L. (1991). *Catalogus librorum in Bibliotheca Rosenthaliana*: A catalogue of the printed books in the Bibliotheca Rosenthaliana, University Library of Amsterdam. In *Hebrew Studies* (Papers presented at a colloquium on resources for Hebraica in Europe held at the School of Oriental and African Studies, University of London, 11-13 September 1989). London, England: The British Library.

Sever, S., & Yosef, B. (1990). The use of microcomputers in Israeli public libraries. In *Developments in microcomputing: Discovering new opportunities for libraries in the 1990s.* Essen: Universitätsbibliothek Essen.

Simsova, S., & Clews, J. (1987). Computers in a multi-script library environment. In *Automated systems for access to multilingual library materials —Problems and solutions.* Munich: K. G. Saur.

Smith-Yoshimura, K. (1994). RLIN's JACKPHY-Plus script development. *Library Hi-Tech, 12*(2), 25-29.

Spalding, C. S. (1977). Romanization reexamined. *Library Resources & Technical Services, 21*(1), 3-12.

Steinberger, N. M. (1994). ALEPH: A bilingual integrated library system. *Library Hi-Tech, 12*(2), 93-96.

Strales, D. S. (1987). Romanizing Arabic script catalog records: Trials, tribulations and success at Ohio State. *MELA Notes, 42,* 8-13.

Tedd, L. A. (1994a). Report on a visit to Egypt, April 1993. *Program, 28*(1), 77-82.

Tedd, L. A. (1994b). Report on the Second Annual Conference of the Arabian Gulf Chapter of the Special Libraries Association, January 1994. *Program, 28*(3), 295-299.

Tehrani, F. (1991). *Negligence and chaos: Bibliographical access to Persian-language materials in the United States.* Metuchen, NJ: Scarecrow Press.

Tucker, A. M. (1987). Non-Roman and multi-script bibliographic databases: Basic issues in design and implementation. In *Automated systems for access to multilingual library materials —Problems and solutions.* Munich: K. G. Saur.

Unicode. (1991-1992). *The Unicode Standard: Worldwide character encoding, Version 1.0.* 2 vols. Reading, MA: Addison-Wesley.

Unicode Consortium. (1993). *The Unicode Standard: Version 1.1: Pre-publication edition.* Mountain View, CA: Unicode Consortium.

Va'ad ha-Lashon ha-'Ivrit. (1955). *Kelale ha-ketiv: hasar ha-nikud.* Jerusalem: Va'ad ha-Lashon ha-'Ivrit.

Van de Vate, K. (1986). The automation of Arabic cataloging in the British Library. In *Arabic resources: Acquisitions and management in British libraries.* London, England: Mansell.

Van de Vate, K., & Bell, J. (1991). Establishing Arabic personal name headings. *MELA Notes, 53,* 10-29.

Vassie, R. (1990). A reflection of reality: Authority control of Muslim personal names. *International Cataloging and Bibliographic Control, 19,* 3-6.

Vernon, E. (1991). Hebrew and Arabic script materials in the automated library: The United States scene. *Cataloging & Classification Quarterly, 14*(1), 49-67.

Weinberg, B. H. (1974). Transliteration in documentation. *Journal of Documentation, 30,* 18-31.

Weinberg, B. H. (1987/88). Retrospective conversion of Hebraica catalog records: Options, issues and visions. *Judaica Librarianship, 4*(1), 17-20.

Weinberg, B. H. (1989). From copy cataloging to derived bibliographic records: Cataloging and its automation in American Judaica research libraries from the sixties through the eighties. In *Judaica librarianship: Facing the future.* Cambridge, MA: Harvard University Library.

Weinberg, B. H. (1990/91). Automation and the American Judaica library during the first quarter century of the Association of Jewish Libraries. *Judaica Librarianship, 5*(2), 167-176.

Weinberg, B. H. (1993/94). Hebraic authorities: A historical-theoretical perspective. *Judaica Librarianship, 8*(1/2), 45-55.

Wellisch, H. H. (1976). Script conversion practices in the world's libraries. *International Library Review, 8*, 55-84.

Wellisch, H. H. (1978). Multiscript and multilingual bibliographic control: Alternatives to romanization. *Library Resources & Technical Services, 22*(2), 179-190.

Wellisch, H. H. (1980). The exchange of bibliographic data in non-Roman scripts. *Unesco Journal of Information Science, Librarianship and Archives Administration, 2*(1), 13-21.

Wien, C. (1994). Arabic books in the Danish Research Library System. Section 8.1. In *Proceedings of the 4th International Conference and Exhibition on Multi-lingual Computing* (London 7-9 April 1994). Cambridge, England: University of Cambridge, Centre of Middle Eastern Studies.

Wien, C. (1995). *Nine problems concerning Arabic*. Unpublished paper presented at the 61st IFLA General Conference, 20-25 August, 166-CAT(WS)-9-E.

Wolfson, L. (1993/94). Hebrew card production from RLIN records at the Klau Library. *Judaica Librarianship, 8*(1/2), 36-39.

Younis, A. R. (1993). *The use of Arabized software packages in Jordanian libraries* [in Arabic]. Unpublished paper.

Zipin, A. (1978). Kitlug ha-'Ivrit be-Artsot ha-Berit be'idan ha-maḥshev. *Yad la-kore, 17*(4), 194-199.

Zipin, A. (1984). Romanized Hebrew script in the online catalog at the Ohio State University Libraries. *Judaica Librarianship, 1*(2), 53-57.

ACRONYMS

ABN	Australian Bibliographic Network
ABN	Agence Bibliographique Nationale
AFNOR	Association Française de Normalisation
AIDMO	Arab Industrial Development and Mining Organization
AIMIS	Arab & Islamic Manuscripts Information System
ALA	American Library Association
ALDOC	Arab League Documentation Centre
ALECSO	Arab League Educational, Cultural and Scientific Organisation
ANSI	American National Standards Organization
ASMO	Arab Standards and Measures Organization
AUC	American University in Cairo
BL	British Library
BLC	British Library General Catalogue
BN	Biblioteca Nacional
BNF	Bibliothèque Nationale de France
BPI	Bibliotheque Publique d'information
CCF	Common Communication Format
CDS	Computerized Documentation Service
CJK	Chinese, Japanese, Korean
CNRS	Center National de Recherche Scientifique
CSIC	Consejo Superior de Investigaciones Cientificas
DIN	Deutches Institut für Normung
ElíAS	Extended Library Access Solutions
ENAL	Egyptian National Agricultural Library
HCT	Higher Colleges of Technology
IDCAS	Industrial Development Centre for Arab States
IDRC	International Development Research Center
IDSC	Information & Decision Support Center
ILO	International Labour Office
IMA	Institut du Monde Arabe
IRANDOC	Iranian Information and Documentation Center
ISO	International Standards Organization
JNUL	Jewish National and University Library
JPL	Jewish Public Library
JTS	Jewish Theological Seminary
KFUPM	King Fahd University of Petroleum and Minerals
KISR	Kuwait Institute for Scientific Research
KUSZA	Koleo Agama Sultan Zainal Abidin
LAMP	Library Automation and Management Program
LC	Library of Congress
LIS	Library Information System
MBS	Multilingual Biblioservice
NCC	Netherlands Central Catalogue
NCOLR	National Council on Orientalist Library Resources
NLDP	Netherlands Library Development Project
NSTIC	National Scientific and Technical Information Center
OSUL	Ohio State University Libraries
PGI	General Information Programme

PI	Preussische Instruktionen
PICA	Project for Integrated Catalogue Automation
PLA	Pakistan Library Association
RAC	Regln für die Alphabetische Katalogisierung
RITSEC	[Egyptian] Regional Information Technology and Software Engineering Center
RLG	Research Libraries Group
RLIN	Research Libraries Information Network
SAMF	Saudi Arab Monetary Fund
TIC	Translation and Information Center
YU	Yeshiva University
WWW	World Wide Web

VITA

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